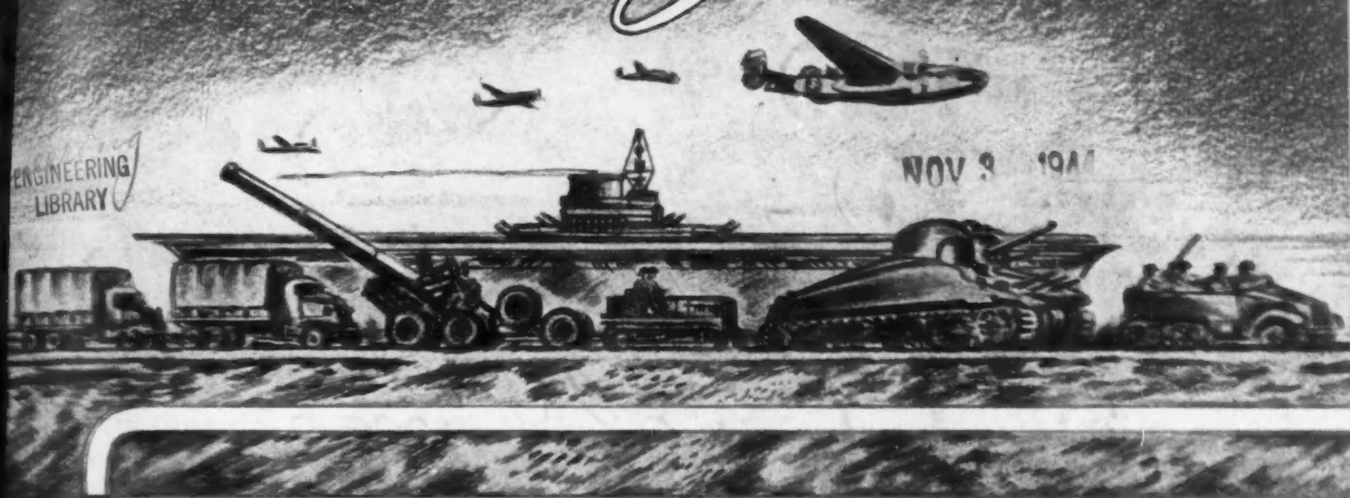
S·A·E Journal



NOVEMBER 1944

SOCIETY OF AUTOMOTIVE ENGINEERS

Blueprint of Tomorrow

HE shattered precedents right and left! By doing so, the automotive engineer helped meet the needs of war. And in his deeds there lies a blueprint of what tomorrow holds.

★ ★ ★

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SAE JOURNAL *Pre-Prints*

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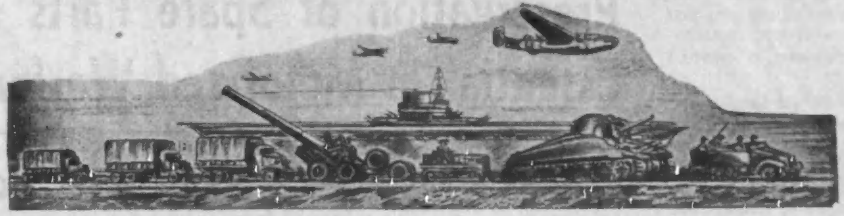

News of the DECEMBER *Issue*

By Norman G. Shidle

Amateurism's Role

WE live as amateurs. We serve others as professionals. We get paid for doing things which the world wants done – and we must have high proficiency and straight-line purpose to be paid well in a competitive economy. We broaden our own lives by doing a variety of things enthusiastically, but indifferently well.

As amateurs, our standards of perfection are conditioned by our own abilities. It is fun for a man who can't read a note of music to see how much emotional pleasure or thought-stimulation he can get out of great symphonies; for the Victory gardener to grow less-than-perfect corn and tomatoes and cabbage; for the poet to build a bridge over the stream which runs back of his house. Our joy arises from seeing how well we can do it – or from being able to do it at all. The aims or performances of the expert do not enter. We are living our own lives . . . we really are living.

As professionals, our performances must measure against those of the best; that relationship is some measure of our worth. High professional abilities bring rewards in money, prestige and power – along with the very real joy of service – which compensate many experts for lack of time to live their own lives as amateurs. Sometimes 100% professionals die happy without ever knowing what they missed by not taking time out occasionally to do something badly.

Being an amateur at many things justifies itself in broadening our interests, improving our understanding of a variety of people – and in making life worth-while. A minor offshoot of active amateurism is better perspective for viewing our own professional aims and efforts.

Aircraft Design Fundamentals Stated Simply in Review of Engineers' Tasks

EVERY once in a while an engineer demonstrates the ability to explain engineering in humanistic rather than technical terms and, almost with the turn of a phrase, gives the lay public an insight and an understanding too interesting to be overlooked.

Case to fit the point is the article on "Fundamentals of Airplane Design" by Design Consultant A. L. Klein, of Douglas Aircraft Co., Inc., to be published in December *SAE Journal*. The subject is one in which the average person scarcely would be, or even could be, interested. Dr. Klein will make it interesting.

He will be discussing the three major fundamentals of all airplane design, which he says are safety, weight, and serviceability, in a way which gives the layman a sense of sympathy with the airplane designer who, like Caesar, has so many things to do at one time. Dr. Klein will break down these essentials into four design maxims which, while possibly wide open to accusations of over-simplification, retain the utterly desirable attribute of being understandable. His "epigrammatic summary:"

1. Parts and devices must "fail safe."
2. Airplanes must be built and serviced by simple tools and simple minds.
3. Actuating systems must be autonomous.
4. Simplicity pays off.

Speaking of safety, Dr. Klein will explain that the merit of American military aircraft in part lies in their ability to fly after some of the engines have been shot out. Discovering how to make that possible, he will recall, was a 10-year job. It has paid big dividends, including saving lives.

He will contend that every man-made device will fail sooner or later. So it becomes imperative that the designer make such expected failures noncatastrophic—landing gears with auxiliary lowering means, brakes with stand-by power, and engines with two magnetos.

And, he will say, since the only unfailing source of auxiliary power in the plane is the pilot's muscles, too much reliance cannot be placed on other sources which make the plane less safe by introducing additional possibilities of failure.

Dr. Klein's discussion of the importance of weight in commercial airplanes will border upon the classic in the form of the simple statement that:

"A saving of 250 lb in weight is worth more than the present first cost of the ship."

For those who like to toy with formulas he will provide equations wherewith they can work their own way to a conclusion that in the 4,000,000-mile operating life of a commercial plane, one pound of weight is worth $600, one ounce of weight is worth $37.50, or slightly more than gold.

He will suggest that a good way to make airplane parts lighter is to make them smaller, or at least to rationalize dimensions to the proportions of the men who fly the planes. Examples of possible progress in this field, he will say, is multiplying the output of an electric generator seven times over, with a gain in weight of only 40%; using electrical wiring which saves 60 lb, or $36,000 per plane.

Manufacturing a plane, Dr. Klein will report, is 80% man-hours spent in assembly and installation operations. Scheduling the parts will be likened to keeping tabs on 200,000 rabbits in a field 2000 ft square. Biggest job of all is making the thousands of parts fit, not accurately, but exactly, despite time, temperature, hour of the day, and condition of the tools.

Future Holds A Promise For Better Auto Steels

AMONG the major benefits of World War II to the American automotive public will be progress in heat-treating and metallurgical processing of steels, with resulting production of parts having greater useful strength.

This means that size can be decreased or load increased, and that, because of greater understanding, important reductions can be made in that margin of insurance against error sometimes called "factor of safety," but more and more becoming recognized as the "factor of ignorance."

Wartime developments in heat-treating appear to have produced not only greater

metallurgical understanding and better automotive parts, but acceptance of the idea that close cooperation between design, metallurgical, and production engineers is essential during initial development.

H. W. McQuaid, of Republic Steel Corp., will review these wartime developments, and others, in December *SAE Journal*. His article will be concerned with the probable effects of wartime progress in steel heat-treating upon the design of automotive equipment.

Deicing Research Opens Vistas of Added Safety

POPULAR conception of airplanes brought to destruction by ice formations on the wings appears to err on the imaginative side. More dangerous, in the opinion of those who fly, is the formation of ice on the induction system and on the propeller.

These dangers are more subtle. Ice formations in the induction system can result not only from meteorological phenomena, but from water, even at temperatures above 32F, taken into the system in sufficient quantities with certain humidities and throttle settings and given the necessary refrigeration in various ways.

Similarly, propellers collect ice quickly and almost invisibly. Ice formation here is dangerous not only because of loss of engine thrust and increase in vibration, but also because the propeller can be put out of balance and particles of ice, hurled by the blades, may damage other parts of the plane.

Man's efforts to assure safe flying during periods of ice formation on planes will be reported in December *SAE Journal* by Lewis A. Rodert, of Ames Aeronautical Laboratory, NACA. The report will be optimistic to the extent that progress is being made in devising protective measures, such as thermal de-icers for wings and empennage, chemical applications before and during flight for propellers, and thermal devices and design changes for induction systems.

Epic of Simplification Cited in Navy Program

FOR all the fun, and charges, levelled against them because of "red tape," military organizations frequently employ refreshingly direct methods of getting things done. For instance, U. S. Navy has discarded 40-odd different sizes of diesel fuel and lubricating oil filters and has replaced them by four standard sizes, a large and a small in each category.

With a war and several million diesel engines all over the world on its hands, the Navy had time neither to quibble over filter characteristics, nor to stock, transport, and service so many different types. It decided that the important functions of its filters are high solid removal rate and long life, and put filters to those tests on an elimination basis. From its filters the Navy also demands resistance to bomb and gunfire shocks, and ability to stand up in water.

In the course of its accelerated and intensive tests the Navy discovered many facts about filters, design, materials, and characteristics which should interest civilian consumers. Lt. H. V. Nutt, E-V(S) USNR, head of Diesel Fuels and Auxiliaries Section, Internal-Combustion Engine Laboratory, U. S. Naval Engineering Experiment Station, Annapolis, will report some of the test findings in December *SAE Journal*.

Preservation of Spare Parts is Essential in Motorized Warfare

LIKELY to be overlooked in mechanized warfare is the service of mechanized supply. The idea of troops marching to battle still bulks large in a popular mind not yet quite abreast of the fact that no troops advance these days unless planes and tanks and trucks prepare the way.

In a pinch troops can, often do, fend for themselves, foraging for food, pilfering from the enemy. Their mechanized equipment, however, remains idle and useless unless and until fueled and serviced. Service of mechanized supply consequently becomes a tactical problem of no little significance.

The American motorist defeated in his attempt to get home before the storm by yesterday's failure to return the screw driver to the car's tool kit will get the idea exactly. No generals in all history can be so embarrassed as those commanding motorized units suddenly immobilized for some obscurely simple reason related to missing tools or parts or spares.

Equal in importance to having the right vehicles and the right parts in the right place at the right time is having parts and spares reach the right place at the right time in the right condition.

The obscure but important job of preparing and preserving such materiel to the end that it might achieve its objective has been the continuing work of SAE War Engineering Board and Packaging Section, U. S. Army Ordnance Department. Their task has been one of heroic proportions if not reputation, for they have developed preserving and packaging methods which have resisted the worst that global warfare has to offer.

These developments include dehydrated packaging, which protects equipment from peak humidities for as long as six months; vapor degreasing and rust-proofing, which neutralize the corrosive effects of fingerprints and moisture on metals within 15 sec; and containers which resist humidity, moisture, water, vapor, immersion, and the roughest handling. Additionally, packaging has been made so durable that worn or damaged equipment can be shipped back in the same containers which brought replacements and spares to field forces. The complete story of these developments will be told in December *SAE Journal* by C. E. Heussner and C. O. Durbin, of Chrysler Corp., who summarize the importance of progress so far made by saying: "All production effort, expense, and transportation space which have been given to an article needed on the fighting lines are wasted if that article does not arrive in a usable condition."

Irksome Aircraft Cooling Problems Give Engineers Cause to Emulate Hamlet

GOOD example of trouble begetting trouble is the application of charge-air cooling systems to aircraft. They increase engine efficiency, but also weight. They assure better performance, but create complications. They give the plane more versatility, but also reduce its aerodynamic efficiency. Their effect upon simplicity of construction, engine accessibility, ease of maintenance, and other advantages is on the detrimental side.

Intercoolers appear to offer so many advantages and disadvantages, many of them intangible and some defying analysis, that the question of whether to install is about on a par with Hamlet's. And Hamlet was much better off than the airframe builders, who have to figure out how to install the systems.

"A great deal must be left to the individual judgment," Holley B. Dickinson, of Lockheed Aircraft Corp., will say in December *SAE Journal*. That sentence seems to sum up the intercooling problem in airplane design, which will be Mr. Dickinson's chief literary concern.

Reduced Factors Aid Sound Prop Selection

ONE of those interesting problems in which final decision must be based upon numerous and conflicting factors, few of which can be altered without affecting the others, is that of fitting a propeller to an airplane.

There are so many types of planes, so many types of propellers, and so many and such varying conditions under which planes must fly, that selecting the best combination of propeller and gear ratio can become a job vastly outranking that needle-and-haystack classic.

However, by eliminating the less essential factors, the task of making a selection can be put on a practical and workable basis, as Performance Engineer R. S. Schairer, of Douglas Aircraft Co., Inc., will explain in December *SAE Journal*. Dr. Schairer will make things a bit easier by limiting the propeller and gear ratio requirements to those of aircraft designed specifically for cruising operation at a wide range of conditions of speed, altitude, and weight.

In this field, he will say, the major considerations are performance, weight, and general arrangement of the plane. The best combination of propeller and gear ratio primarily is dependent upon take-off wing loading, take-off power loading, and the range for which the plane is designed.

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TRANSACTIONS SECTION


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Transport Tops

Discussion Interest

at L. A. Aero Meeting

J. L. Atwood (right), executive vice-president, North American Aviation, Inc., general chairman of the 1944 SAE National Aeronautic Meeting, Oct. 5-7, Los Angeles

FUTURE engineering requirements of air transportation around a 60-hr world were spotlighted against a background of war engineering developments at the well-attended SAE National Aeronautic Meeting and Aircraft Engineering Display held October 5, 6 and 7 in the Biltmore Hotel at Los Angeles, Calif.

While essential design, production, and operational techniques of post-war commercial transport planes dominated both formal speaking programs and ensuing discussions, noticeable also were the disposition to apply wartime lessons to post-war engineering, widespread interest in small, economical planes for civilian use, and indications that tomorrow in the air may bring:

- New era in power generation, with turbines, jets, or both, propelling air, sea, and land vehicles.
- Globe-girdling cruises by airplane, with side trips by helicopter.
- Safety, speed, comfort, and cost predominant factors in plane design.
- Efficient maintenance techniques expediting transport operations, extending flying hours, curtailing grounded time.
- Large transport planes rivaling ocean liners in accommodations.
- Environmental requirements of global air travel, learned in war operations, fully met in peacetime planes.
- War-developed design and production techniques yielding better, safer, and cheaper aircraft.

Registration at the meeting exceeded 1500, with total attendance estimated at more than 2000.

Joint sponsors of the Aeronautic Meeting, with the SAE Aircraft, Aircraft Engine, and Air Transport Engineering Activities, were the SAE Southern California, Northern California, Oregon, and Northwest Sections, the Aeronautical Chamber of Commerce, Air Transport Association, and National Aircraft War Production Council, Inc.

J. L. Atwood was general chairman of the meeting, and J. H. Kindelberger was chairman of the Aircraft Engineering Display.

A new feature of aeronautic meetings, symposium on air transport operational problems, developed the primary importance of such aircraft design features as safety, speed, comfort, and cost. Operators insisted that operational techniques start at the designers' drafting boards, pointing out that otherwise the completed plane might be lacking in one or more of the four essential design factors and protesting that current operational difficulties frequently are caused by shortcomings in design.

Getting down to cases, operators reported that methods for detecting and extinguishing fires constitute serious design problems

The three SAE vice-presidents whose Activity Committees sponsored the SAE National Aeronautic Meeting are, left to right: A. T. Gregory, Aircraft Engine; R. D. Kelly, Aircraft, and William Littlewood, Air Transport

Active in the SAE National Aeronautic Meeting in Los Angeles were these Government officials and members of various SAE standards committees. From left to right are Lloyd Worden, Aircraft Resources Control Office; Capt. G. E. Davisson, AAF; B. R. Teree, Curtiss Airplane Division; Flight-Lt. D. G. Moffitt, British Air Commission; Hall L. Hibbard and L. D. Bonham, Lockheed Aircraft Corp., and H. D. Hoekstra, Civil Aeronautics Administration

far from being solved, and cited instances of inadequate fire-protection facilities in baggage and express compartments. These were said already to be classified as "common" fire-hazard locations. They contended that airplane firewalls are not yet designed for full effectiveness, and listed unsatisfactory location of fire controls as a "design sin" crying for correction.

Statement of engineering opinion that tomorrow's huge transport planes will be too large for indoor servicing and will require a continuous maintenance system which assures 18 hr of operation daily and overhaul every 5000 hr without grounding the plane for servicing for more than six hours at any one time, led to discussion whether a daily operating period exceeding the present 13 hr is practical. Operators reported that difficulties created by weather, scheduling, traffic requirements, and the whims of the traveling public now preclude the possibility of greater utilization.

Here again responsibility was traced to the plane designer, who was told he must, to the greatest possible extent, eliminate even the necessity for maintenance, and thereafter intelligently apply operating knowledge and experience data to the end of making the plane an easily-maintained unit.

Safe operation of the larger transport planes was reported also to be promoted by the use of stall-warning devices, such as air-flow-sensitive units which, installed on the airfoil, operate lights in the pilot's compartment to indicate when airspeed becomes dangerously low.

New Problems Disclosed

Symposium on environmental requirements of global air travel disclosed a veritable host of new engineering problems created by quickly transitional climatic and atmospheric conditions. It was pointed out that in global operations, small factors can be just as disastrous as large, and planes must be designed, built, and equipped to withstand virtually all the extremes of weather from heat to cold and from tropical cloudbursts to condensation caused by sudden changes in altitudes and climates.

Wartime operation of planes at extreme altitudes, in polar regions, and in the tropics was said to have indicated a need for scientific investigation into the effects of temperature variation upon aircraft materials, and for accurate determination of the thermal coefficients of expansion of such materials. It was pointed out that a plane must be designed and built to withstand temperature changes, of as much as 40 F for each 1000 ft of altitude, which create stresses on the order of 29,200 lb psi, particularly in fixed structural members and parts employing force fits.

Protection against corrosion under a wide variety of humidity conditions was characterized as vitally important to globe-girdling planes. War experience was drawn upon to explain how, in the tropics, high humidity shorts magnetos, moisture condensing in fire detectors gives false warnings, and moisture absorption by gaskets fogs gun-sight lenses. Both corrosion and ice formation were said to be destructive of electrical equipment at high altitudes, making necessary the use of surface covering, lubrication, and rust inhibitors.

Before projected super-planes can undertake regular global flights, engineers were told, engineering problems by way of flutter and fatigue failures must be solved through rigorous application of the principles of dynamics. The landing impact of large planes, gun blast effects, and structural response to large powerplants were reported to have aggravated flutter and fatigue problems to an extent which makes it no longer possible to meet the situation merely by increasing strength or rigidity. Indicated needs were described as a high degree of rigidity in the plane's primary structure, utilization of construction materials having high fatigue strength, and careful attention to design details which may affect stiffness.

Engineering discussion of problems re-

Aeronautic Executives Gather for Los Angeles Meeting

Prominent among members and guests of the Los Angeles Aeronautic Meeting were, left to right: John K. Northrop, president, Northrop Aircraft, Inc.; Eddie Molloy, vice-president, Ryan Aeronautical Co.; C. W. Coslow, manager, Vultee Field Division, Consolidated Vultee Aircraft Corp.; G. Geoffrey Smith, editorial director of *Flight* and *Aircraft Production*, London; Mac Short, vice-president, Lockheed Aircraft Corp., who was host at an informal dinner during the meeting; Brig.-Gen. D. F. Stace, AAF; Thomas Wolfe, vice-president, Western Air Lines, Inc.; Henry McFadgen, vice-president, Jacobs Aircraft Engine Co., and William B. Stout, Consolidated Vultee Aircraft Corp.

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WINS MANLY AWARD.......

J. O. Almen (left) receiving the SAE Manly Memorial Medal from A. T. Gregory, SAE vice-president for Aircraft Engine Engineering, Oct. 6, at the SAE National Aeronautic Meeting for his paper "Shot Blasting to Increase Fatigue Resistance." The paper was presented in June, 1943, before the SAE War Materiel Meeting, and was widely commended for advancing the technique of producing airplane engine parts having maximum strength with minimum weight. Mr. Almen is chairman of the SAE Subdivision on Shot Peening, and is an engineer with the Research Laboratories Division, General Motors Corp.

lated to post-war design and production of aircraft produced the information that, in developing fundamental design details for landing gears, man is learning a great deal from the birds but is confronted by much larger problems. Birds were said to experience no difficulties with such basic principles as retraction, energy absorption, mechanical linkages, and minimum weight, nor are they concerned with the problem of landing a 200,000 to 300,000 lb body at high speeds, a requirement with tomorrow's super-planes.

Dual or tandem wheels equipped with small-diameter tires were reported to appear promising for modern planes of 120,000 lb gross weight. Since planes are tending to outgrow even this development, engineering thinking was said to be turning to landing gears comprised of interchangeable multi-wheel articulated undercarriage units which retract into space between the floor beams.

Global war in the air also was reported

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Consulting Engineer

to be highly influential in developing new design and production techniques applicable to peacetime needs, particularly by providing a gigantic testing ground productive of valuable engineering data which never could have been obtained in laboratories. Operation and maintenance of aircraft and equipment by relatively inexperienced personnel

British Editor Lauds Jet-Propelled Planes

Widespread use of jet-propelled planes in war and commerce was predicted by G. Geoffrey Smith, editorial director of the British publications, *Flight*, and *Aircraft Production*, in an address before an informal dinner at which SAE President William S. James was host during the SAE National Aeronautic Meeting.

Mr. Smith, who is in the United States as a representative of the British Supply Council, commended SAE for war engineering work, particularly in the field of aircraft standardization, and declared the next five years are ripe with possibilities of revolutionary changes in types and methods – including jet propulsion.

"Scientists and aerodynamicists have many new problems for urgent solution," he said, "not only in the design of multistage turbine units driving propellers, or with jet propulsion, or both, but also in regard to wings and structures of low drag. Control of boundary layer, in view of new potential speeds, is of paramount importance . . .

"It may confidently be expected that, within measurable distance of time, jet propulsion will play a big part in both war and commercial aviation."

was said to have taught additionally valuable lessons and to have trained thousands of men.

Listed among the specific lessons of war vital to post-war design and production were:

Vulnerability of aircraft hydraulic systems to gunfire, cold, and altitude; advisability of using electrically-operated accessory and instrument systems in aircraft; discovery that alternating current is superior to direct; necessity for sealing critical units against dust, moisture, corrosion, and atmospheric conditions; possibilities of employing many new materials, such as magnesium, permalloy, alnico, and beryllium copper.

Pertinent to post-war production was the reported development of a device, the "Sonigage," which, through contact with one surface, accurately and rapidly measures the critical thickness of an airplane part after final machining.

Wartime progress in the technique of producing alloy steel forgings for aircraft was said to have resulted both in the produc-

turn to p. 34

All papers presented at this SAE National Aeronautic Meeting will appear in a later issue of the *SAE Journal* either in full in the Transactions Section or as digests.

SPEAKERS

Co-author: "Radio Interference and the Aircraft Engine"

WESTCOTT HEATH, JR., Wright Aeronautical Corp.

"Passenger Comfort in Commercial Aviation"

CHARLES W. MORSE, Airesearch Manufacturing Co.

Co-author: "High Altitude Factors in Flight Testing"

SIDNEY R. SILBER, Boeing Aircraft Co.

"Fitting People Inside a Machine"

HENRY DREYFUSS, Industrial Designer

"Fuel Injection for the Aircraft Engine"

F. J. WIEGAND, Wright Aeronautical Corp.

Co-author "Fuel Injection for the Aircraft Engine"

D. W. MEADOR, Wright Aeronautical Corp.

"High Altitude Factors in Flight Testing"

MARVIN MICHAEL, Boeing Aircraft Co.

"Aircraft Environment, Thermal Effects"

T. N. FLOYD, Douglas Aircraft Co., Inc.

"The Prediction of Engine Cooling Requirements by a Graphical Method"

FRANK H. ERDMAN, Wright Aeronautical Corp.

Co-author: "The Prediction of Engine Cooling Requirements by a Graphical Method"

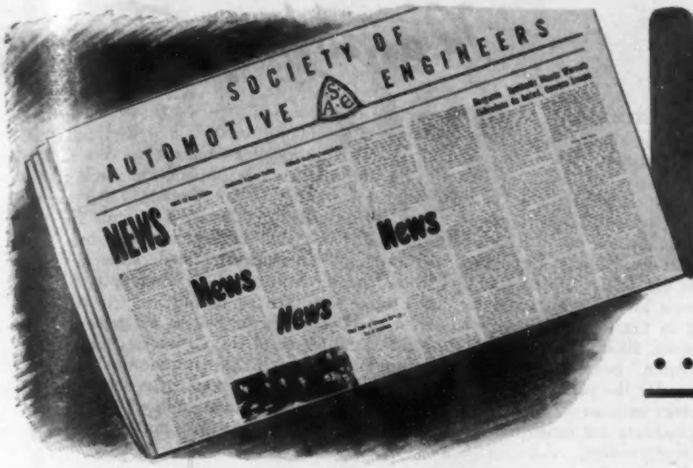
W. M. S. RICHARDS, Wright Aeronautical Corp.

"The Development of Plastic Materials for Aircraft Construction"

MAJ. RUSSELL M. HOUGHTON, AAF Materiel Command

"Research and Tomorrow's Aircraft Undercarriage"

R. W. BROWN, Firestone Tire & Rubber Co.



News.. ..OF THE SOCIETY

Section Chairmen "Certificates of Appreciation" Now Being Presented

CERTIFICATES of appreciation for their service as chairmen of SAE Sections and Groups have been presented to 189 men at fall meetings of nine Sections and one Group. The past-chairmen of 17 other Sections and three Groups are scheduled to be similarly honored at presentations planned for coming meetings.

"Certificates of Appreciation" from the SAE were presented to past chairmen of the Cleveland Section at an Oct. 9 meeting. All past chairmen of SAE Sections are being so honored, and ceremonies similar to these have been or will be held by each SAE Section and Group.

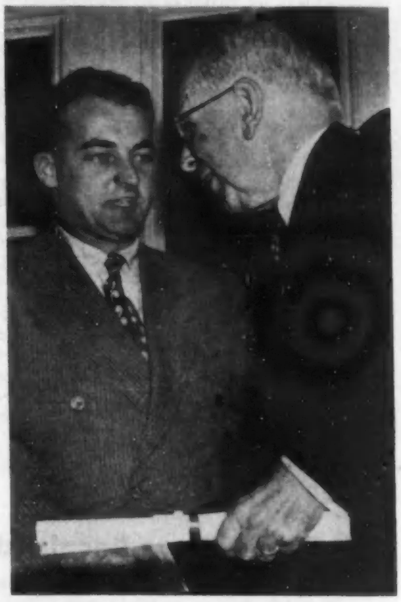
In August of this year, the Executive Committee of the Society's Council approved a Sections Committee plan to award these certificates of appreciation to all living Section past-chairmen who still are members of the Society.

Indiana Section began the making of these presentations at its Sept. 21 meeting upon the occasion of the visit of SAE President William S. James and Secretary John A. C. Warner, Cleveland Section made award Oct. 9; Chicago, New England, and Pittsburgh Sections on Oct. 10, Oregon Section on Oct. 11; Colorado Group on Oct. 16; Texas and Metropolitan Sections, Oct. 20; and Kansas City Section, Oct. 23.

Southern New England Section plans to present certificates at its Nov. 1 meeting; Southern Ohio Section on Nov. 2; St. Louis Section on Nov. 8; and Wichita Section on Nov. 15. Other Sections and Groups are scheduled to make awards at later meetings.

These certificates are similar in size and appearance to SAE membership certificates. Each is endorsed by the Society's president and secretary, and bears the past-chairman's name, Section or Group name, dates of service, and a statement of appreciation for loyalty and accomplishments in his chairmanship duties.

It is planned that the awarding of certificates of appreciation will become an established procedure recognizing the effort and contributions of retiring Section and Group chairmen toward the work and programs of the Society.



SAE Cleveland Section Chairman R. S. Huxtable presents the Society's "Certificate of Appreciation" to Dr. James Herron, first chairman of the Cleveland Section, 1914-1915

Mawjr Photos

Present to receive their certificates in person at the Oct. 9 meeting of the SAE, held at the Cleveland Club were the following past-chairmen of the Cleveland Section, standing front row (left to right): Arthur Townhill, 1941-42; Walter S. Howard, 1933-34; Orrel A. Parker, 1922-23; James H. Herron, 1914-15; Harry F. Gray, 1943-44; T. V. Buckwalter, 1926-27; second row (left to right): Arthur O. Willey, 1939-40; Arch T. Colwell, 1935-36; Hubert C. Snow, 1919-20; Carl F. Oestermeyer, 1931-32; Thomas S. Kemble, 1932-33; B. Frank Jones, 1937-38; Present Chairman R. S. Huxtable; third row (left to right): John E. Hacker, 1938-39; William E. England, 1929-30; Arthur J. Scaife, 1916-17; S. L. Bradley, 1927-28

To Visit England On Aero Standards

REPRESENTATIVES of the SAE Aeronautics Division, the National Aircraft Standards Committee, and the Working Committee of the Army-Navy Aeronautical Board will constitute a mission to Great Britain to explore the possibilities of international standardization of aircraft equipment.

The tentative agenda includes:

1. Obtaining more detailed information on the British method of handling aeronautical standardization problems;

2. Comparing this with current U. S. standards practice;

3. Determining the attitude of British manufacturers and the British Government toward domestic and international aeronautical standpoints on the basis of both domestic industry and military advantages;

4. Surveying the British Government-Industry cooperative effort;

5. Exploring possible ways and means as well as the desirability for collaboration between Great Britain and the United States on post-war international aeronautical standards, and

6. Obtaining further views on specific suggestions made recently on various points of basic differences in British and American standards.

The mission was invited to Great Britain by the British Government and aircraft industry officials. SAE representatives appointed by Arthur Nutt, chairman of the Aeronautics Division, are L. D. Bonham, Lockheed Aircraft Corp.; Gustaf Carvelli, Wright Aeronautical Corp., and J. D. Redding, of the SAE staff.

Representing the Army-Navy Aeronautical Board will be Lt.-Col. R. G. Gaillard, a member of its Working Committee. The leader is F/Lt. D. G. Moffitt, RAF, of the British Air Commission. Eric Dudley, Airplane Division, Curtiss-Wright Corp., T. P. Herne, Ryan Aeronautical Corp., and E. W. Norris, Aeronautical Chamber of Commerce of America, will represent the NASC.

IAE Publications Received

The SAE has received from the Institution of Automobile Engineers two recent technical publications which have been placed on file in the SAE Library at SAE Headquarters in New York. "Friction of Ball & Roller Bearings" by L. Rosenfeld is one of the publications; "Piston Ring and Cylinder Wear in Automobile Type Engines" is the other.

Fuels Job Progressing

THE Tractor Fuels Committee of the SAE Tractor War Emergency Committee reports considerable progress in developing agreement on simplifying fuels for tractors and farm equipment. At a recent meeting refiners agreed that a 40 octane fuel will be feasible in the post-war era as one of two specifications. A problem posed by these distillates is that of adequate distribution to farmers and other users of these fuels, it was pointed out by representatives of refiners.

Rambling Through Se

INITIAL CANADIAN SECTION meeting of the season Sept. 22 celebrated in traditional fashion with an annual dinner at the Hamilton Golf and Country Club . . . Enthusiastic response by more than 176 visitors greeted guest speaker C. W. Lockard's talk on Canada's war effort on the production, economic and fiscal fronts . . . Mr. Lockard, president of International Harvester Co. of Canada, Ltd., praised the wisdom of the Dominion in providing priority for farm implements for the Motherland when many were urging that all plowshares be beaten into swords and Great Britain stood alone against the Axis . . . This priority, he declared, made it possible for British agriculture to become the most mechanized and most efficient per capita in the world, and for the United Kingdom to become largely self-sustaining in the production of food when the U-boat threat was at its greatest . . .

"Despite the best of planning, a considerable degree of dislocation and disruption is inevitable," he concluded, "in the reconversion period. The automotive industry's planning for the future requires that taxation be revised to permit the accumulation of reserves without which stability in employment will be impossible. There cannot be a substitute for prosperity – an elaboration of the production and exchange of goods and services" . . .

Known as the man who has fired more kinds of guns than any other person alive, and who is more informed about Germany's equipment and weapons than the average Nazi general, Lt.-Col. G. B. Jarrett, chief of Foreign Materiel Branch, Aberdeen Proving Ground, was well equipped to discuss Enemy Materiel at **CLEVELAND SECTION'S** Sept. 11 meeting . . . Col. Jarrett, who collected many enemy weapons when he was with the British Army in North Africa, and who has analyzed other items that were returned from fighting fronts to the Aberdeen Museum, summed up the outstanding features of German ordnance as follows:

Shown during discussion period are (l. to r.): Robert Cass, secretary, Cleveland Section; Capt. T. M. Girdler, Jr., White Motor Co.; Com. R. J. Moore, USN, Cleveland Section Chairman R. S. Huxtable; Col. Jarrett and Cleveland Section Vice-Chairman Roger Weider

A machine gun that is light, easy to make, and adaptable to many tactical uses has an inaccurate high rate of fire, and an excessive ammunition expenditure which unduly taxes manufacturing and supply routes . . .

Tanks, which are welded to permit rapid assembly, yet whose welding is so poor that out-of-range shots from enemy weapons where the impact is too weak for a penetration actually jar loose this welding . . .

Propellent powders, made of ersatz ingredients where, in order to attempt to produce powders of a recognized standard and potential, many other substances have had to be added, so that the potential is actually lowered . . .

Wide use of plastics, some of which have not the strength to carry out their mission long enough to realize a satisfactory service life, and lavish use of synthetic rubber, which has a short life . . .

Two designs of steel cartridge cases, which, while making possible the shooting of the piece, cannot always allow for proper storage of the ammunition for very long . . .

Many German ordnance items, however, although no better than ours, are very good ordnance . . .

Lowdown on Washington affairs and on automobile research and development were each a subject of discussion at the opening meeting of the **DETROIT SECTION** Oct. 2 . . . Technical talk of the day, "The Influence of the War on Automobile Research and Development," was made by E. V. Rippingille, who predicted that the first thought of engineers about new automobiles will necessarily be to eliminate troubles that have come to light . . . Sheet metal is generally in poor condition, he said, especially where salt is used on the streets . . . The speaker declared it is impossible to tell how long it will be before "type changes" are made, but the industry has a marvelous background of war technology, which, though not glamorous, will permit many engineering dreams to come true . . . Mr. Rippingille's opinions on some specific developments were: gas turbines will be closely watched by automotive engineers . . . lightweight materials will not be used for entire automobiles but will be used where there is a necessity for lifting objects . . . there will be more sealed units . . . The real source of American war power, declared *Detroit News* ace Washington corre-

Section Reports

spondent Blair Moody, and the real reason we have an edge on the rest of the world, is Detroit and its engineers . . . However, the situation is not so clear-cut in Washington, where there are a multitude of agencies represented on various committees exercising positions of total control over industry war production and reconversion program . . . One of the most serious defects facing the country, Mr. Moody asserted, is the lack of vision and leadership in Congress, and he predicted that this will continue, regardless of who is in the White House as president, unless the public accepts its responsibility to vote and elect good representatives to Congress . . .

Preceding the meeting Fred Van Devanter, of radio station WJR, gave a brief pre-election speech in which he advised that the majority of people should get out and vote . . .

Dr. Sanford A. Moss, General Electric Co., spoke before a group of 250 members and guests at **MILWAUKEE SECTION'S** Oct. 6 meeting . . . It was the second time in the past several months that an SAE Section had the pleasure of hearing Dr. Moss' informative exposition on Internal Combustion Engines, and learning the history and accomplishments of the gas turbine now in commercial use from this eminent authority on the subject . . . Paper was presented at Northwest Section meeting April 7, where it was received with the same wholehearted interest of the Milwaukeeans . . .

History of combustion turbine and turbosupercharger were related at **NORTHERN CALIFORNIA SECTION** meeting Sept. 12 by R. W. Carruthers, General Electric Co. . . . According to the speaker, the turbosupercharger saw little service between World Wars I and II, although it was used by Gen. Billy Mitchell during his bombing experiments when he sunk several obsolete battleships . . . He cited typical operating conditions of present units, which afford a 40-50% power at sea level and will maintain sea level manifold pressure to an altitude in excess of 30,000 ft . . . Present production of these units, thousands of which are made monthly for military aircraft, reaches the staggering figure of 10,000,000 hp per week . . .

Discussing the Evolution of Some Current Military Aircraft at the same session, Lt.-Col. G. W. Rogers, chief of maintenance with the Fourth Air Force in the Pacific Coast area, drew from his own experience when he told audience how B-17 and B-24 heavy bombers were developed . . . Tracing the growth of the B-17 from 1939 to the present, Col. Rogers pointed out that the gross weight of the plane has increased from 44,000 lb to 62,000 lb with present armor plate, armament and other additional devices to facilitate safe operation for long distance overwater flying . . . The B-24, first acquired by the AAF in 1941 with a designed weight of 48 lb and no armor plate, now weighs 67,000 lb, the increase being due to added armor and fire power . . . Neither of these planes has had the size of its engine increased over this period, however, although the operating conditions of the engines had been changed gradually to obtain more horsepower . . .

At question box meeting of **OREGON SECTION** Sept. 11, query was: Since diesel engines are subject to high pressure and heat, why wouldn't it be advantageous to break them in for a few hours without compression by driving with another motor until high rough spots had set at least partly before running them under their own compression . . .

Discussers stated it is very injurious to operate a diesel engine during the run-in period whether driven by oil jacks, line shaft, or other methods of external drive at slow idle speeds under usual compression speeds pressure—because in a diesel engine there is no vacuum to assist in maintaining the oil film between the cylinder wall and rings . . . Surfide treatment, which forms iron sulfide deposits with extreme pressure qualities, was suggested . . . Result of treatment is that high points are softened and the material is moved to valleys, or low points, in the cylinder with no danger of scuffing . . .

Same Section scored Sept. 15 with two meetings in one day . . . At first session member described the events of a service call he made to investigate the complaint of a truck having a flat spot starting at 1400 rpm and continuing to 2200 rpm . . . He checked the carburetor, and after considerable experimentation, lowered the float level until he arrived at 1/64 in. plus 0.005 in. below factory recommended setting, improving the operation of the unit . . . Vancouver Service Command Shops was the scene of the second meeting, where Major C. L. Falls, host, escorted members through the various shops . . . Turkey dinner at the Officers' Club, and sound movies of the bombing of Schweinfurt and invasion of Tarawa were post-scripts to day's tour . . .

Anticipating a brilliant future for aviation, Oliver L. Parks, founder of Parks Air College, told **ST. LOUIS SECTION** Sept. 19 some conclusions of the post-war planning committee of the college . . . First, air transport as an industry is expected to be 10 times larger than it is eight years from now . . . Second, there will be feeder lines for international trade airports. These feeders should be somewhat like the present DC3, with 20-24 passenger capacity and with more baggage racks by seats to eliminate bother of checking bags. Such a ship must land and take

concluded on following page

Involute Spline Project Advances

DATA of the proposed Involute Spline Standard presented for discussion and correction at the Sept. 22 meeting of the new Spline Subdivision of the SAE Parts and Fittings Division, in Flint, Mich., was accepted as satisfactory for presentation to the cooperating groups for their acceptance.

The proposed Involute Spline Standard has been expanded to cover a range of sizes from ⅛ in. to 20 in. pitch diameter. This range requires 14 basic hobs and is accomplished with a spread of teeth from 6 to 50. There are three types of fits given; viz., sliding, locating, and press, and these in turn are classed as to the fit on the major diameter, the sides of the teeth, and the minor diameter.

The tooth form is based upon ½ diametrical pitch of 30° pressure angle with the addendum equaling the dedendum and each equaling one-half of the diametral pitch. Charts are given covering nomenclature, dimensioning of drawings, comparison of sizes with tooth dimensions, spline size selection for fits adjacent to standard antifriction bearings, basic data of ½ diametral pitch and method of figuring sizes with pins.

Complete data for each pitch and number of teeth are given under separate headings, external and internal, and makes a very comprehensive arrangement for the designer, toolmaker, producer and inspector of fittings.

Groups working on the standard include the Involute Spline Committee of the American Standards Association and representatives of the American Gear Manufacturers Association and the National Machine Tool Builders Association.

W.E.B. To Issue Manual

THE U. S. Army Ordnance Department has requested the SAE War Engineering Board to write a manual of design for corrosion proofing of military vehicles.

The project will be initiated by a survey of all types of corrosion treatment used by the industry as well as Army specifications. This survey will be augmented by the gathering of all new practices developed in recent years.

The manual will be used by equipment designers to guide them in specifying the optimum treatment of electrical and mechanical units, and will embrace plating, bonderizing, metal spraying, and all types of paints and resin finishes for the various parts.

J. L. McCloud, Ford Motor Co., will serve as chairman of the project.

SAE Pamphlets Out Soon

PREPARATION of a new series of SAE Standards pamphlets is under way for early publication. Subjects are: Iron & Steel Specifications, Non-Ferrous Specifications, Rubber Compounds, Automotive Lighting, Storage Batteries, and Screw Threads.

These are reprints from the SAE 1944 Handbook.

Rambling Through Section Reports

continued from preceding page

off in 1000 ft on a one to seven glide angle to permit it to land in smaller fields . . . Third, ships carrying 50-80 passengers which fall within specifications of taking 1000 ft to land will be developed for use by commuters from nearby suburbs to centers of large cities . . . Fourth, Mr. Parks looks for greatly increased private flying with so-called foolproof airplanes of which the Ercoupe is an example . . . In order to make private flying possible, air parks are proposed, which will be small ports distributed widely over the country for everyone who flies a small airplane . . . Expense for these would be borne by Government bodies, hangars would be rented out, and the revenue from the hangars would pay for maintenance cost . . .

"Ceiling will be unlimited for the engine when the bridge of closer relationship between fundamental research and applied science can be gapped," Eugene E. Wilson, vice-chairman of United Aircraft Corp., declared before a meeting of **SOUTHERN NEW ENGLAND SECTION** Oct. 4 . . . Reviewing the expansion of aviation to date, Mr. Wilson said that the performance of the industry perils us now, and the very magnitude of the expansion is a danger to our struggle for survival . . . This industry reconverts to a condition where a great surplus exists, while the automotive industry, which has expanded little, will reconvert to a great lack of its product . . . To exaggerate this condition, he continued, the aviation industry has not a mass production product, comparing a peak production now of 100,000 units with a normal peacetime output of 4,000,000 units for the automobile industry . . . Mr. Wilson believes aviation will welcome a cut back to a small percentage of its present production; it is a quality industry, and the speed and mobility of the product eliminates the requirements for a large number of units . . . He concluded that the aviation industry is not asking for a subsidy but only for a chance at "cutthroat competition." . . .

Arthur Nutt's ideas on the future trends of aviation were given at **PEORIA GROUP** meeting Sept. 15 when he stated that the only hope for airplane production is in military needs throughout the world . . . The commercial outlook is only a drop in the bucket even if the demands increase tenfold, and he placed his beliefs entirely apart from those who say "postwar airplanes will be as commonplace as automobiles" . . . Mr. Nutt said that those who maintain 100,000 fliers in the Armed Forces will own and operate planes on their return home are wishful thinkers, for their wives and families will be too fearful of danger . . . He spoke of the ever-increasing field of research for more power from present engines, asserting that jet propulsion would come into practical view at high altitudes and high speeds . . . He objected, however, to calling the helicopter a backyard plane when he asked "What happens when the engine fails with altitudes of from 50-300 ft and what happens when a rotor blade stops or comes off in flight" The answer was a picture of flight straight down. . . . Movies which had been used to impress pilots with the necessity of properly operating controls to eliminate overstressing of engine parts with improper combustion supplemented his talk . . .

Guest speaker Arthur Nutt smiles his acknowledgment of a successful meeting to C. G. A. Rosen (left), technical chairman of the evening, and J. M. Davies, Peoria Group chairman

Trip through the plant of the Los Angeles Refinery of Union Oil Co. of Calif. was made Sept. 9 by **C. I. T. STUDENT BRANCH** . . . Guides traced out complete refining process, from crude through heating, fractionation, and cracking, taking off at various points samples of the products and explaining details of the equipment . . . Design and uses of microswitches were shown in film "Uses Unlimited" to same group Sept. 19 . . .

Steel Additive Agents

A COMPREHENSIVE report of the SAE War Engineering Board's Iron & Steel committee on its Special Additive Agent Program, requested of the Society by the Army Ordnance Department, is being written by L. A. Danse, General Motors Corp., with the cooperation of an editorial steering committee.

The project, initiated a year ago, involved the melting of steel heats with these agents and test work by fourteen companies. Several heats were made up of steels and cost was defrayed by the Ordnance Department in its search for an adequate substitute for high alloy steels. One of the heats was of 100 tons.

The task undertaken by Mr. Danse involves the analysis of the 14 series of test data, and will form the basis of further metallurgical research in this new area. The report will be transmitted to the Ordnance Department as soon as completed.

R. W. Rousch, Timken-Detroit Axle Co., chairman of the W.E.B. Iron & Steel Committee and R. B. Schenck, Buick Motor Division, General Motors Corp., made the progress report of the project to the SAE War Engineering Board Aug. 18, when the program was highly commended by a spokesman of the Ordnance Department.

Mud Traction Tests

ORGANIZATION of the SAE Tractor War Emergency Committee's Mud Testing of Military Vehicles Committee – under the sponsorship of Lester S. Pfost and chairmanship of Emil F. Norelius – has been completed. Until recently Chairman Norelius was a lieutenant colonel on the staff of the Office of the Chief of Ordnance-Detroit.

A group of the committee, with Paul Huber, General Motors Proving Ground, and W. E. Zierer, Chrysler Proving Ground, representing automobile manufacturers on the project, met Aug. 25 to learn in detail from Aberdeen Proving Ground officers the problems.

Again the committee met Sept. 7 and 8 at the Farm Tillage Laboratory of the Department of Agriculture, Auburn, Ala., to witness demonstrations of tractive effect of Army equipment in mud of several types.

The committee has undertaken to advise the Ordnance Department on methods of testing equipment running in mud, and to set up a series of test stands at Aberdeen for conducting a series of studies of traction.

Tire Simplification

INDICATIONS that tire manufacturers are committed to as much simplification as possible of tractor and farm equipment tires have stimulated the project of tire simplification undertaken some time ago by the SAE Tractor War Emergency Committee.

At a recent meeting, the Tire Simplification Committee of the TWEC selected one of the proposals for simplification submitted by the Tire & Rim Association. This has been revised, and was circulated to equipment manufacturers for their comments and criticisms.

The tire manufacturers pointed out that simplification will tend to conserve tire molds and other manufacturing equipment, and reduce dealer stocks, as well as simplify the supply problem for farmers and other users of such equipment.

ANNUAL DINNER
Procedure Modified

A DIFFERENT procedure for handling dinner reservations will be introduced at the Annual Dinner to be held on Wednesday evening, Jan. 10, during the SAE 1945 Annual Meeting at the Book-Cadillac Hotel, Detroit, Mich. The new procedure was developed by the SAE Meetings Committee to alleviate the problem of accommodating the overwhelming demand for reservations at the dinner. This demand has grown in recent years to such an extent that hundreds of SAE members could not be accommodated by hotel facilities.

Approved by the SAE Council, objective of the new procedure is to give every SAE member an equal opportunity, not only to obtain a dinner reservation, but also to select his own table location. Basis of the entire procedure is "First Come, First Served" and only one ticket to each member, viz:

About Dec. 1, reservation blanks will be mailed to every SAE member entitling him *to apply individually* for one ticket. Applications received on any other form or not signed by an SAE member will not be honored. Tickets then will be distributed to members up to the full hotel capacity in order of their receipt. To give all members an equal opportunity, mailing of applications to members in different sections of the country will be timed so that all applications returned immediately will arrive at about the same time.

There will be no reservations for tables or seats at tables at the dinner; seating at tables will be on a first-come, first-served basis. No one without a ticket will be admitted.

Decision to hold the 1945 dinner at the Book-Cadillac Hotel and to operate it under this new procedure was made only after it was learned that the Detroit Masonic Temple would be unable to accommodate the dinner in 1945. To hold the 1945 dinner in the Fountain Room of the Detroit Masonic Temple had been the preferred recommendation of the SAE Meetings Committee since that room has a capacity of from 1400-1600 diners – probably sufficient to accommodate all who would desire to attend.

SAE National
AIR CARGO MEETING
DECEMBER 4-6

Knickerbocker Hotel, Chicago

MONDAY, DEC. 4

MORNING

A Study on the Efficiencies of Cargo Airplane Designs
– Dr. R. J. Nebesar, Universal Moulded Products Corp.

Cargo Plane Design from the Operator's Standpoint
– H. E. Hoben, American Airlines, Inc.

AFTERNOON

Transport Operation Experiences with Cargo Airplanes
– Charles Graddick, United Air Lines

The Relation of Cargo Handling to Air Terminal Services
– Jared B. Morse, Boeing Airplane Co.

A Proposal for the Establishment of Commercial Air Cargo Service
– Carlos Wood and A. B. Croshere, Jr., Douglas Aircraft Co., Inc.

EVENING

Military Session, to be announced

TUESDAY, DEC. 5

MORNING

Cargo Handling Equipment Design
– C. L. Moon, Mechanical Handling Systems, Inc.

Saving Ground Time in Air Cargo Handling
– H. S. Pack, Pennsylvania Central Airlines

AFTERNOON

Tiedown and Stowage Equipment for Air Cargo
– W. C. Mentzer and E. C. Mitchell, United Air Lines

Accessory Provisions Peculiar to the Cargo Airplane
– M. J. Parks, Airplane Division, Curtiss-Wright Corp.

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EVENING BANQUET

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WEDNESDAY, DEC. 6

MORNING

Symposium: Characteristics of Air Cargo Shipments

Manufactured Goods Including Merchandise
– J. A. Wooten, American Airlines, Inc.

The Air Cargo Factor in Manufacturing
– Allen Dean, Detroit Board of Commerce

Specialties
– A. W. French, Transcontinental & Western Air, Inc.

Packaging Problems
– Thomas Wolfe, Western Air Lines, Inc.

AFTERNOON

Airplane Design for Feeder Operation
– Herb Rawdon, Beech Aircraft Corp.

Design Requirements for Pickup Aircraft
– A. B. Schultz, All American Aviation, Inc.

KANSAS CITY SECTION

Air Transport Engineering Meeting

NOV. 16-17, 1944

Hotel Continental ▪ Kansas City, Mo.

THURSDAY, NOV. 16

MORNING Operations

Recent Communications Development *– Howard Morgan, Transcontinental & Western Air, Inc.*

Operation of Consairways by Convair *– J. B. Rea, Consolidated Vultee Aircraft Corp.*

AFTERNOON Airframes

Converting Military Aircraft for Commercial Use *– James Clyne, Douglas Aircraft Co., Inc.*

Future Aircraft Materials *– Dr. C. C. Furnas, Curtiss-Wright Corp.*

■ ■

DINNER

Thursday Evening Continental Room

Carl Berry

Chairman, SAE Kansas City Section

John A. C. Warner, toastmaster

William S. James, President, SAE

C. J. McCARTHY

United Aircraft Corp.

Aircraft Manufacturing and Air Transportation

■ ■

FRIDAY, NOV. 17

MORNING Powerplants

Notes on Some Factors Affecting the Selection of Powerplants for Modern Transport Aircraft *– P. D. Doran, Pratt & Whitney Aircraft*

Propellers *– W. J. Blanchard, General Motors Corp., Aeroproducts Division*

AFTERNOON Maintenance

Aircraft Maintenance *– R. L. Anderson, Chicago & Southern Airlines*

Cockpit Lighting of Transport Aircraft *– Luther Hoffman, Transcontinental & Western Air, Inc.*

SAE Coming Events

National Meetings

Aeronautic & Engineering Display, *Oct. 5-7, Biltmore Hotel, Los Angeles*

Fuels & Lubricants, *Nov. 9-10, Mayo Hotel, Tulsa*

Air Cargo, *Dec. 4-6, Knickerbocker Hotel, Chicago*

Annual Meeting & Engineering Display, *Jan. 8-12, 1945, Book-Cadillac Hotel, Detroit*

Aeronautic, *April 4-6, 1945, Hotel New Yorker, New York*

Diesel F & L, *May 16-17, 1945, Carter Hotel, Cleveland*

War Materiel, *June 4-6 , 1945, Book-Cadillac Hotel, Detroit*

Tractor, *Sept. 12-13, 1945, Schroeder Hotel, Milwaukee*

Baltimore – Nov. 9

Engineers Club; dinner 6:30 p. m. Helicopter – Laurence W. LePage, president, Platt-LePage Aircraft Co.

Buffalo – Nov. 15

University Club; dinner 6:30 p. m. Heat Exchangers – Laurence P. Saunders, chief engineer, Research Division, Harrison Division, General Motors Corp.

Canadian – Nov. 15

Royal York Hotel, Toronto; dinner 6:30 p. m. Aircraft In General Transportation After the War in Canada – John McDonough, president, Central Aircraft, London, Ontario.

Chicago – Nov. 14 and 21

Nov. 14 – Hotel Knickerbocker, dinner 6:45 p. m. Trends in Post-War Truck and Engine Design – Merrill C. Horine, sales promotion manager, Mack Mfg. Corp.

Nov. 21 – Turner Hall, South Bend; dinner 6:45 p. m. Automotive Vacuum Brakes – T. H. Thomas, chief engineer, B-K Vacuum Power Equipment, Bendix Products Division, Bendix Aviation Corp.

Cleveland – Nov. 13

Cleveland Club; dinner 6:00 p. m. Shot Peening – J. O. Almen, head of Mechanical Engineering Dept. No. 1, Research Laboratories Division, General Motors Corp.

Colorado Group – Nov. 13

Meeting 8:00 p. m. Modern Methods of Producing Gears – George H. Sanborn – chief field engineer, Fellows Gear Shaper Co. Motion Picture – Gears At War.

Detroit – Nov. 6

Horace H. Rackham Educational Memorial Bldg., dinner 6:30 p. m. The Combustion Gas Turbine – Dr. J. T. Rettaliata, Allis-Chalmers Mfg. Co. Frank S. Spring, Hudson Motor Car Co. – We Fly for Adventure.

Metropolitan – Nov. 9

Hotel Pennsylvania; meeting 7:45 p. m. The Supercharging of Two - Stroke Diesel Engines – Richard Herold, president, Sulzer Bros., Ltd.

Milwaukee – Nov. 3

Milwaukee Athletic Club; dinner 6:30 p. m. War Construction in Alaska and Aleutians – H. W. Richardson, Western Editor, Engineering News Record.

New England – Nov. 14

Engineers Club, Boston; dinner 7:00 p. m. Diesel Goes to War – J. H. Maloney, advertising and promotion manager, Detroit Diesel Engine Division, General Motors Corp. Motion Picture – Invasion-Nazi Version.

Northwest – Nov. 3

Gowman Hotel, Seattle; dinner 7:00 p. m. Hard Chrome Plating as Applied to Automotive Maintenance – C. W. Jay, Electro Chrome Co. Hard Chrome Plating of Automotive Parts – William Hubka, Seattle Transit System. Motion Picture – Troops in Action.

Oregon – Nov. 3

Benson Hotel, Portland; dinner 7:00 p. m. Outlook for Highway Sound Track Systems – Delmar L. Brown.

Peoria Group – Nov. 27

Jefferson Hotel; dinner 6:30 p. m. Speaker – Robert Cass, chief engineer, White Motor Co. Subject to be announced.

Philadelphia – Nov. 8

Engineers Club; dinner 6:45 p. m. Symposium on Winterization of Automotive Equipment. Speakers – R. H. Dalgleish, Jr., assistant to vice president of operations, Philadelphia Transportation Co. E. P. Gohn, automotive engineer, Atlantic Refining Co. H. C. Riggs, engineer, Electric Storage Battery Co.

Pittsburgh – Nov. 28

Webster Hall; dinner 6:30 p. m. The Trend in Fleet Type Bearings – Ralph A. Schaefer, and John K. Anthony, Cleveland Graphite and Bronze Co. – Speaker Ralph A. Schaefer.

St. Louis – Nov. 8

Forest Park Hotel; dinner 6:30 p. m. Automotive Engineering Horizons – W. S. James, chief engineer, Studebaker Corp., and president, SAE. Guest – John A. C. Warner, secretary and general manager, SAE.

Southern California – Nov. 9 and 30

Nov. 9 – Ambassador Hotel, Los Angeles; meeting 8:00 p. m. Cam Type Engines – Lt. Commander Carl Herman.

Nov. 30 – Hollywood Roosevelt Hotel, Los Angeles; dinner 7:00 p. m. Fuels of the Immediate Present and Future – Dr. Gustav Egloff, director of research, Universal Oil Products Co.

Southern New England – Nov. 1

Hotel Bond, Hartford; dinner 6:30 p. m. Yankee Ingenuity in Engineering – William L. Merill, engineer, General Electric Co. Engineering for Foreign Trade – William Hunt, William Hunt & Co.

Southern Ohio – Nov. 2

Engineers Club, Dayton; dinner 6:30 p. m. Metallurgical Factors Affecting the Selection of Steel Bars for Surface Hardening – John M. Birdsong and Elbert A. Hoffman. Motion Picture.

Texas – Nov. 13

Baker Hotel, Dallas; dinner 6:30 p. m. Automotive Engineering Horizons – W. S. James, chief engineer, Studebaker Corp. and president, SAE. Guest – John A. C. Warner, secretary and general manager, SAE.

Twin City Group – Nov. 2

Curtis Hotel, Minneapolis; dinner 6:30 p. m. Speaker to be announced.

Wichita – Nov. 15

Lassen Hotel; dinner 6:30 p. m. Automotive Engineering Horizons – W. S. James, chief engineer, Studebaker Corp. and president, SAE. Guest – John A. C. Warner, secretary and general manager, SAE.

Committee Personnel

COUNCIL has approved the appointments of the following committee personnel:

N. L. Mochel, Westinghouse Electric & Mfg. Co., has been named to the Iron & Steel Division to represent ASTM on Panel X, Section C – General Users. T. E. Worley, American Steel Foundry, succeeds H. C. Keysor on this committee;

Major Warren C. Landis, Office of the Chief of Ordnance-Washington, has been approved as an alternate for Major R. E. Jeffrey, Jr., and Lt.-Col. J. M. Sills as alternate for Lt.-Com. C. J. Livingston, on the Lubricants Division, as requested by Col. B. L. Neis of the Army Service Forces;

George D. Shaeffer has been appointed to the Motorcoach & Motor Truck Division; and

J. N. B. Miller, Glenn L. Martin Co., is now serving on the Non-Metallic Materials Division and the SAE-ASTM Technical Committee A on Rubber, replacing Jane B. Hutson as an SAE representative.

P. T. Brantingham, International Harvester Co., and Leo Mayer, Cole-Hersee Co., have been appointed to the Electrical Equipment Division.

Mayo Hotel ■ **Tulsa, Okla.**

NOVEMBER 9-10

THURSDAY, NOV. 9

MORNING

A Survey of Past and Present Trends in Lubricating Oil Additives
– W. A. Wright, Sun Oil Co.

Detergency or Dispersancy in Heavy-Duty Engine Oils?
– Carl Georgi, Quaker State Oil Refining Corp.

AFTERNOON

Some Comments on Engine Testing of Heavy-Duty Oils
– Norman C. Penfold, Engine Research Laboratory, Armour Research Foundation

Testing Heavy-Duty Lubricating Oils for Naval Service
– Lt. A. D. Brabbs, U. S. Naval Engineering Experiment Station

THURSDAY EVENING DINNER

Review of Coordinating Research Council Activities
– C. B. Veal, Coordinating Research Council

The Importance of Fuels and Lubricants in SAE Activities
– W. S. James, President, SAE

FRIDAY, NOV. 10

MORNING

Development of Greases for Military Vehicles
– Major N. W. Faust, Ordnance Department

Military Aircraft Grease Lubrication
– Major S. C. Britton and Dr. W. Schlesinger, AAF Air Technical Service Command, Wright Field

AFTERNOON

Fuel Requirements of Automotive Diesel Engines – Automotive Diesel Fuels Division, Coordinating Fuel Research Committee
– F. C. Burk, Atlantic Refining Co.; G. H. Cloud, Standard Oil Development Co.; W. F. Aug, Mack Mfg. Corp.

The Occurrence of Vapor Lock as Related to the Temperature V/L Characteristics of Motor Gasolines (Based on a Report of the Coordinating Research Council – Cooperative Fuel Research Committee)
– E. W. Aldrich, National Bureau of Standards; E. M. Barber, The Texas Co.; and A. E. Robertson, Standard Oil Development Co.

FRIDAY EVENING DINNER

Fuels and Lubricants in the Pacific
LT.-COL. R. E. JEFFREY, JR.
Office of the Chief of Ordnance

About SAE

WALTER E. BURNHAM is now staff engineer for Beech Aircraft Corp., Wichita, Kan. He had been connected with Freedman-Burnham Engineering Corp., Cincinnati, as vice-president and chief engineer. Mr. Burnham is past vice-chairman of SAE Southern Ohio Section, Cincinnati District.

JOHN TAAFE, a technical adviser for the U. S. Army, has moved from Fort Meade, Md., to the Service Division Post Ordnance, Camp Breckinridge, Ky.

CALVIN E. COOK, who had been in the U. S. Army Corps of Engineers, Washington, as a mechanical engineer, is now in the U. S. Navy, stationed at the Great Lakes Naval Training Station, Ill.

J. E. FERNLY is a technician for Packard Motor Car Co., and may be contacted at A. P. O. 671 c/o Postmaster, New York City. He had been research engineer for Bennett Pump Co., Division John Wood Mfg. Co., Muskegon Heights, Mich.

Previously an instructor in the mechanical engineering department, Engines Division, University of Minnesota, Minneapolis, MYRL A. LINDEMAN is now a mechanical engineer at the Naval Ordnance Laboratory, U. S. Navy Yard, Washington.

ARTHUR F. BASKE, in civilian life junior engineer for General Motors Corp., Proving Ground Division, Milford, Mich., is now in the U. S. Army, stationed at Camp Wolters, Tex., A Company, 63rd Battalion, Third Platoon.

ROMEY A. HENDERSON has joined Howard Electric Co., Detroit, as a machinist. He was previously an instructor in machine shop practice for the St. Louis (Mo.) Board of Education (Vocational Training War Workers).

LESLIE D. CALHOUN has been appointed assistant chief engineer in charge of design and development, General Machinery Corp., Hamilton, Ohio. He has been design engineer for Busch-Sulzer Bros. Diesel Engine Co., St. Louis, Mo.

HECTOR RABEZZANA, who had served for 28 years as chief engineer for AC Spark Plug Division, General Motors Corp., Flint, Mich., has been named president of General Research & Development Co., Fenton, Mich.

Hector Rabezzana

VICTOR LEVESKIS is no longer charge man and draftsman for Moore Dry Dock Co., Oakland, Calif., having been named field engineer for U. S. Electrical Motors, Inc., San Francisco.

Myron B. Gordon Joins Fairchild

Myron B. Gordon, formerly vice - president and general manager of Wright Aeronautical Corp. and a vice-president of Curtiss-Wright Corp., has been elected a director of Fairchild Engine & Airplane Corp. and appointed a vice-president in charge of operations. Mr. Gordon, who directed the expansion of facilities and production of Wright engines required by the war, supervised the development of the 14- and 18-cyl Cyclone engines

SAE members in the Armed Forces who have received recent promotions include: SIDNEY G. HARRIS, former SAE Metropolitan chairman, A. P. O. 676 c/o Postmaster, Miami, Fla., to lieutenant colonel; KNIGHT S. CARSON, Wright Field, Dayton, Ohio, to major; D. C. AKERS, JR., and WILLIAM T. DRURY, Wright Field, Dayton, to captaincy; HENRY W. COOPER, Granite City Engineering Depot, Granite City, Ill., to staff sergeant; and HAROLD J. DAVIS, Aberdeen Proving Ground, Md., to corporal.

In the Navy JOHN L. HACKER, U. S. Navy Yard, Philadelphia, and MICHAEL B. COMBERIATE have been raised to lieutenant (jg).

Formerly airplane mechanic's helper, Pan American Airways, Miami, Fla., JOSEPH B. NEWCOMER is now an inspector for American District Telegraph Co., Atlanta, Ga.

FRANK B. LARY has joined Wright Aero Ltd., Los Angeles, as chief field engineer. He was formerly employed at Wright Aeronautical Corp., Paterson, as field engineer.

LT. M. D. GRUSH, USMC, has been transferred from Camp Pendleton, Oceanside, Calif., and may be reached c/o Fleet Post Office, San Francisco, Calif.

FRED H. LaFRENTZ has recently formed his own company, Liquefied Petroleum Gas Co., Glendale, Calif., of which he is president. He was formerly district manager and butane carburetor instructor of American Liquid Gas Corp., Los Angeles.

LEONARD V. NEWTON, vice-president of Market Street Railway Co., San Francisco, has been retained for a three-year period by the board of supervisors (by a vote of 9 to 2) as consulting expert when the system is merged with the municipal railway. Commenting editorially upon Mr. Newton's appointment, the Sept. 7 issue of the *San Francisco News* states: "That expert help will be needed in consolidating the two streetcar systems and developing an integrated single system is obvious. Mr. Newton, having been the operating head of the MSRy for many years, is aware of the problems peculiar to San Francisco. He has been managing a financially strangled transit service. With the city's backing he should be able to do with the new municipal system many things he tried to but could not do with the broken down Market Street outfit."

JOHN W. SANDS, who had been with the Conservation Division of the War Production Board, Washington, since January, 1942, has resumed his duties with the Development & Research Division, International Nickel Co., Inc., New York City, as metallurgist.

Members

CHARLES M. EDMONDS, previously assistant sound engineer, Alexander Film Co., Colorado Springs, Colo., and radio service man for Manitou Electric (Radio Division), Manitou Springs, Colo., is now connected with Research Associates, Manitou Springs, where he is working on the development of sound recording and large public address systems.

JOHN D. HAYDEN, fireman first-class, U. S. Navy, has been transferred from Camp Peary, Williamsburg, Va., and may be reached at Fleet Post Office, San Francisco.

C. R. PATON, directing engineer of a new project at Packard Motor Car Co.'s Toledo (Ohio) plant to handle advanced aircraft engine development at the specific request of the AAF Air Technical Service Command, has formed an engineering staff in the Advance Model Aircraft Engine Division. The following SAE members have joined his staff: H. J. BUTTNER, formerly chief test engineer, Allison Division, GMC; ROBERT M. WILLIAMS, formerly experimental installation engineer, same company; HOWARD G. REED, previously with Willys-Overland Motors, Inc., as chassis engineer; A. E. GIBSON, formerly assistant to the president, Turbo Engineering Corp.; G. A. SPRAGUE, formerly with Allison Division, GMC, as product engineer; C. E. SCHAEFER, who had been at Purdue University; T. R. SCHULZ, formerly experimental engineer of product study, General Motors Corp., Aircraft Development Division; and J. P. ZIMMERLE and H. C. NIMRICK, from the Packard-Detroit plant.

VAN M. DARSEY, formerly technical and service director of Parker Rust Proof Co., Detroit, was recently named president of the company, as well as a member of the board of directors. Mr. Darsey's association with the organization started when he twice won the Parker Rust Proof fellowship at Adrian College in 1926 and 1927.

Returns to Socony-Vacuum

W. M. Holaday has returned to Socony-Vacuum Oil Co. as general manager of the Research & Development and Technical Service Divisions, after an absence of a year and a half. During this period he served with the Petroleum Administration for War as chief of the Aviation Section and later as assistant director of refining. Mr. Holaday is a member of the SAE Fuels & Lubricants Activity Committee and the SAE General Research Committee

ROBERT L. HARTLEY has returned to Narragansett Machine Co., Providence, R. I., where he was formerly employed, to work in the experimental engineering department. He was lately an engineer for Lincoln Machine Co., Inc., Pawtucket, R. I.

C. H. DOLAN, II, formerly president and general manager of Carl Dolan Corp., New York City, is now vice-president and general manager for Allied Engineering Corp., New Haven, Conn.

GEORGE LeROY HARTMAN, USMCR, may be contacted at Training Company A, Engineer Battalion, 20th Platoon, Specialist Training Regiment, Training Command, Camp Lejeune, N. C. He was formerly chief draftsman, Superior Coach Corp., Lima, Ohio.

RENE BERG has been named president of American Premaberg Co., Inc., New York City. He had been general manager and consulting engineer of the same company, specializing in oil, gas and chemical equipment. Rene Berg is also secretary of the French Engineers in the U. S. Society.

CARLES F. LOEW, formerly machine designer, Bendix Aviation Corp., Teterboro, N. J., has accepted a position as project engineer with Robinson Aviation, New York City.

FRANK A. DONALDSON, JR., an ensign in the U. S. Navy, is now at the Naval Supply Depot, Mechanicsburg, Pa. He had been project engineer for Donaldson Co., Inc., St. Paul, Minn.

ENSIGN HENRY T. GIERYN, U. S. Navy, who had been an engineer for Continental Aviation & Engineering Corp., Detroit, in civilian life, is now stationed at the Aeronautical Engine Laboratory, Naval Air Material Center, Philadelphia.

JOHN W. HOLDEMAN is now on the engineering staff of Detroit Gear Aircraft Parts Division, Borg-Warner Corp., Detroit. He had been with Packard Motor Car Co. in the same capacity.

TIMOTHY E. COLVIN has been elected president and a member of the board of directors of Aerco Corp., subsidiary of Transamerica Corp., Los Angeles. Mr. Colvin was

Van M. Darsey

Rene Berg

Timothy E. Colvin

formerly vice-president in charge of the Burbank Division of Aircraft Accessories Corp.

Henry Thomas Platz

HENRY THOMAS PLATZ has been appointed district manager of Sciaky Bros., Cleveland, for the State of Ohio and eastern and northern Indiana. He had been doing consulting engineering work for the past year, before which he had been associated with Briggs Mfg. Co. for 20 years as chief and then executive engineer.

Previously chief test pilot for Brewster Aeronautical Corp., Johnsville, Pa., **WOODWARD BURKE** is now director of flight research for McDonnell Aircraft Corp., St. Louis, Mo.

CONRAD OLIVER ROGNE, JR., who had been tool and machine designer, Boardman & Waters Consulting Engineers, Los Angeles, is now an engineer for American Camera Co., Hollywood, Calif.

LT.-COL. W. H. FISHER, formerly at Camp Hood, Tex., may now be reached at P. O. Box 415, c/o Postmaster, Belton, Tex.

HERBERT J. LAWES, a brigadier general in the U. S. Army, has been transferred from Letterkenny Ordnance Depot, Chambersburg, Pa., to the ASF Training Center, Ordnance, Aberdeen Proving Ground, Md.

R. H. WOLCOTT, who had been with Consolidated Vultee Aircraft Corp., New Orleans, La., as assistant group leader of materials engineering, is now with Gates Rubber Co., Denver, Colo., as product development engineer.

LOUIS KRISTOFF, formerly chief metallurgist for National Aluminum Cylinder Head Co., Cleveland, is now foundry metallurgist for Reynolds Metals Co., Springfield, Mass.

Previously assistant foreman of production planning and shipping, Beech Aircraft Corp., Wichita, Kan., **JOHN B. WILEY** is now senior manufacturing engineer for Lockheed Aircraft Corp., Burbank, Calif.

CAPT. THOMAS J. HART, U. S. Army Air Forces, has been transferred from Wright Field, Dayton, Ohio, to Headquarters, Washington, D. C.

Previously sales engineer, Hyatt Bearings Division, General Motors Corp., Detroit, **JOHN D. ROACH** is now affiliated with Bower Roller Bearing Co., same city.

K. D. SMITH has recently joined Worcester Wire Works, Division National-Standard Co., Worcester, Mass., after having spent several months in Detroit doing special work for the Army Service Forces, Office of the Chief of Ordnance – Detroit.

ROBERT W. WOODRUFF is now in the U. S. Navy, stationed at Whiting Field, Milton, Fla. As a civilian he had been a draftsman for International Plainfield Motor Co., Plainfield, N. J.

BERNHARDT J. LITKE, flight engineer and instructor for the U. S. Army Air Forces, has moved from the flight engineering school in Salina, Kan., to Lowry Field, Denver, Colo.

DAVID E. ANDERSON, formerly a consulting engineer with offices in Detroit, is now with Thompson Products, Inc., Cleveland, in an engineering capacity.

LT. ROLLIN D. RICHTER, who had been in the U. S. Army Corps of Engineers, Engineering Section, Army Service Forces Depot, Columbus, Ohio, may now be reached at A. P. O. 503, c/o Postmaster, San Francisco.

L. J. HENDERSON, previously assistant manager of the Aviation Division, Weatherhead Co., Cleveland, has been named assistant general sales manager of the company.

L. J. Henderson

JOHN H. KRESTAN, who had been plant manager, Swan-Finch Oil Corp., Chicago, is now connected with Battenfeld Grease & Oil Corp. of N. Y., North Tonawanda, N. Y.

O. W. McMULLAN, a member of the SAE Iron & Steel Division, has left Youngstown Sheet & Tube Co., East Chicago, Ind., as metallurgist, to join Bower Roller Bearing Co., Detroit, as chief metallurgist.

LEO J. SHANNON has been assigned as field engineer representative for Chandler-Evans Corp., Wright Field, Dayton, Ohio. He had formerly worked in a similar capacity at the company's home plant in South Meriden, Conn., before which he had been employed as carburetor test inspector for Wright Aeronautical Corp., Paterson, N. J.

HOWARD FRANCIS DOLL is now with National Mineral Co., Chicago, as assistant works manager and plant superintendent. He was formerly chief engineer for Dumore Co., Racine, Wis.

SAE members who have received recent changes in company status are: **E. J. BURNELL**, Norman E. Miller & Associates, from West Coast manager in Los Angeles to assistant general manager in Detroit; **WILBUR T. PERRY**, Kinner Motors, Inc., Glendale, Calif., from chief draftsman in Plant 2 to design engineer; **W. J. HIX**, Consolidated Vultee Aircraft Corp., Vultee Field, Calif., from laboratory engineer to structures test engineer; **E. VERLIN BROWN**, Curtiss-Wright Corp., Propeller Division, Indianapolis, from assistant chief inspector to chief inspector; **JOHN J. PALERMO**, Simmonds Aerocessories, Long Island City, N. Y., from group leader in the Mechanics Division to group leader of push pull controls; **WALTER R. FREEMAN**, Wagner Electric Corp., St. Louis, Mo., from engineer in charge of automotive development to manager of the Automotive Development Division; **GEORGE R. JAMIESON**, Wright Aeronautical Corp., Paterson, N. J., from test engineer to production liaison engineer; **M. LeROY STONER**, Eastern Aircraft Division, GMC, Linden, N. J., from standards engineer to chief of standards; **A. E. SHELTON**, Consolidated Vultee Aircraft Corp., from division manager of the Stinson Division, Wayne, Mich., to the Allentown, Pa., branch; **Y. W. SMITH**, automotive and diesel engineer for Sinclair Refining Co., has moved from the Columbus (Ohio) plant to the one in Chicago; **E. W. FREEMAN**, chief engineer for Cities Service Oil Co., Ltd., Toronto, Ont., has been transferred to the Lake Charles, La., office; **BENN KELLER, JR.**, representative for Packard Motor Car Co., has returned from overseas where he was a technician for the Army Air Forces, and is now connected with the service department, Aircraft Engine Division, Detroit; **BRUCE CRANE**, field engineer for Ethyl Corp., has been transferred from the Boston to the New York City office; **ROBERT U. WHITNEY, JR.**, Elastic Stop Nut Corp., Union, N. J., from product engineer to experimental engineer; **STANLEY G. MARKS**, Allis-Chalmers Mfg. Co., from the engineering department in Plant 2 of the Springfield Works, Springfield, Ill., to industrial district manager in Milwaukee; **SAMUEL S. MANSON**, National Advisory Committee for Aeronautics, Cleveland, from principal mechanical engineering aide to research engineer; **J. H. DANNAN**, Consolidated Vultee Aircraft Corp., Fort Worth, Tex., from group leader of the thermodynamics group to group engineer of hydraulics; **EDMUND L. WINDELER**, Fisher Body Division, General Motors Corp., from the central engineering department in Detroit to project engineer in Cleveland; **DARROL N. HARRIS**, Shell Oil Co., Inc., from research engineer in Martinez, Calif., to technical applications engineer in the San Francisco office; **HARRY L. SMITH, JR.**, Aluminum Co. of America, Pittsburgh, from manager of casting sales to manager of sheet sales; **MELVIN D. MILLER**, American Airlines, Inc., from cargo traffic manager in New York City to regional vice-president in Dallas, Tex., and **R. H. CLARK**, Consolidated Edison Co. of N. Y., from general superintendent of electrical distribution to manager of commercial buildings and properties.

LOWELL S. HARDING is now operations analyst and technical adviser to the director of supply and maintenance, Headquarters, U. S. Army Air Forces, Washington, D. C. He had been vice-president in charge of operations, Colonial Airlines, Inc., Jackson Heights, L. I., N. Y.

SAE student members newly engaged in engineering work in various production plants throughout the country include:

	Formerly at	Employed by
F. R. HOLLIDAY	Chrysler Institute	Chrysler Corp.
HARRY DORNBRAND	College of the City of New York	National Advisory Committee for Aeronautics
JACK A. BERT	Oregon State College	California Research Corp.
GEORGE H. CHANEY, JR.	Oregon State College	Hyster Co.
ROBERT B. BATCHELOR	Purdue University	Chrysler Corp.
WARREN C. BURGESS	University of Michigan	National Advisory Committee for Aeronautics

J. CURWEN ROLLO, formerly in the engineering department of Noorduyn Aviation, Ltd., Montreal, Que., is now power-plant engineer for Canadian Vickers Aircraft Ltd., same city, where he is employed in the design department.

Formerly vice-president of Machinery Design, Inc., Detroit, **JOHN JOSEPH PETRIK** is now the owner of Engineering Development Co., same city.

THOMAS CARNEY, previously with International Harvester Co., Fort Wayne, Ind., as engineer of new development, is now in Australia with International Harvester Co. Pty., Ltd., as manager of engineering.

WILLIAM R. DONALDSON, who had been with the U. S. Army Ordnance Department, Detroit, as chief of the Production Section, Tank Bureau, is now regional manager for the Palnut Co., Irvington, N. J.

PAUL R. JORDAN, formerly general manager of Harvill Corp., Los Angeles, is now the owner of a consulting firm specializing in industrial engineering and technical data.

MURTY R. CALLAHAN, who had been district manager of Thermoid Co., Trenton, N. J., has become assistant to the district manager, Walker Mfg. Co., Racine, Wis.

J. M. ROTH has been appointed to the engineering department of Thompson Products, Inc., Cleveland. He had been director of engineering, Pesco Products Co., same city.

Previously chief engineer, Radiator Division, Fedders Mfg. Co., Inc., Buffalo, N. Y., **JOSEPH ASKIN** has the same position now with Peerless of America, Marion, Ind.

FRED L. HALL has been appointed director of sales for Kiekhaefer Corp., Cedarburg, Wis. He had been vice-president in charge of sales for Rogers Diesel & Aircraft Corp., New York City.

Fred L. Hall

H. M. BRAMBERRY, SR., has entered the consulting engineering business with headquarters at Newcastle, Ind., where he will work on metallic wear surface filling and treatments. Mr. Bramberry was formerly director of piston ring engineering, Spring Division, Borg-Warner Corp., Bellwood, Ill.

DONALD FRANCIS STAUB, a former student at the University of Detroit, is now in the U. S. Navy, and may be reached at the Great Lakes Naval Training Center, Great Lakes, Ill.

FOREST R. McFARLAND, who is with Packard Motor Car Co., Detroit, has received the position change from project engineer to research engineer.

JAMES L. CARSON, who had been civilian engineer for the U. S. Army Signal Corps, Fort Monmouth, N. J., is now overseas as a member of the Foreign Economic Administration. He is principal requirements officer and chief of the transportation section for the Balkans, and is also expected to act as an adviser on transportation matters.

CHARLES W. PERELLE, formerly vice-president in charge of manufacturing, Consolidated Vultee Aircraft Corp., San Diego, Calif., is now vice-president and general manager, Hughes Tool Co., Houston, Tex.

DR. C. A. CROWLEY and Dr. A. Kenneth Graham have announced the formation of the firm of Graham, Crowley &

Dr. C. A. Crowley

Associates, Inc., as consulting electro-chemists and engineers. This new organization is a consolidation of the professional practices of Technical Service Bureau, Inc., Chicago, of which Dr. Crowley was director of research, and of A. Kenneth Graham & Associates, Jenkintown, Pa.

PHIL C. FAITH, a captain in the U. S. Army who had been serving overseas, may now be contacted c/o New York City Omnibus Corp., New York City.

LAURENCE P. SUTLEY, formerly process engineer for Pioneer Engineering & Mfg. Co., Detroit, is now with Continental Motors Corp., same city, in a similar capacity.

CHARLES L. TUTT, JR., who had been assistant professor of mechanical engineering, Princeton University, Princeton, N. J., is now associate editor of Product Engineering, McGraw-Hill Publishing Co., New York City.

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OBITUARIES

Lewis Roscoe Baker

Lewis Roscoe Baker, who had been sales manager for McKinnon Columbus Chain, Ltd., St. Catharines, Ont., Canada, died recently at the age of 56. He spent long periods of service with the two companies he had been chiefly associated during his lifetime. From 1919-1931 he was general manager for Canada of Burgess Battery Co. in Winnipeg and Niagara Falls, after which he was transferred to Chicago as general sales manager of the company. He returned to Canada in 1934 to join McKinnon, and remained there as head of sales until his death.

Harry C. Branch

Harry C. Branch, service engineer for Leece-Neville Co. since 1926, died recently. He was 55 years old. Mr. Branch, a graduate from the Case School of Applied Science, received his industrial experience in the engineering departments of Leece-Neville, Teagle Co., and Bishop Babcock Co., all in Cleveland, before returning to Leece in a service capacity.

Raymond L. Spragle

Raymond L. Spragle, a member of the SAE since 1916, died recently at the age of 52. He had been automotive engineer for American Car & Foundry Co. in St. Charles, Mo. Mr. Spragle began his career with Herschell-Spillman Co. in 1912, and later was connected with Studebaker Corp., Northway Motor & Mfg. Co., and Premier Motor Corp.

J. Mackenzie Miller

J. Mackenzie Miller, 49, chief engineer of Bendix Aircraft Carburetor Division, died June 17. Mr. Miller, a graduate of the University of Cincinnati, had been employed in several technical capacities before going to McCook Field, Dayton, in 1920. He remained there for seven years, after which he joined Stromberg Motor Devices Co., remaining there until he went to Bendix in 1930. He had been an SAE member for 22 years.

Optimum Use of Synthetic Tires is Being Studied

The SAE-ODT Maintenance Methods Coordinating Committee on Application and Maintenance of Synthetic Tires met Sept. 13 in New York and paused long enough for this picture. From the center foreground around the table (right to left) are M. E. Nuttila, Cities Service Oil Corp.; Jean Y. Ray, Virginia Electric & Power Co.; E. N. Hatch, New York City Transit System; Henry Jennings, SAE staff, and George Flint, Rubber Manufacturers Association. At the head of the table (left to right) are Chairman E. P. Gohn, Atlantic Refining Co., James C. Zeder, Chrysler Corp., and chairman of the SAE War Engineering Board. Left to right on the far side of the table are S. M. Cadwell, U. S. Rubber Co.; John Walker, Mack Mfg. Corp.; H. Paxson, Atlantic Refining Co.; T. C. Smith, American Telephone & Telegraph Co.; William J. Cumming, ODT; R. B. Wuerfel, Chevrolet Motor Division, GMC, and G. M. Sprowls, Goodyear Tire & Rubber Co.

FELIX C. REICHLIN has recently joined AiResearch Mfg. Co., Los Angeles, as project engineer. He had been design engineer for the same company.

SAMUEL KALMIN, a first lieutenant in the U. S. Army Ordnance Department, has been transferred from Normoyle Ordnance Motor Base, San Antonio, Tex., to the Maintenance Division, Office of Chief of Ordance – Detroit.

ARTHUR G. KANE, JR., is no longer with Lear Avia, Inc., Piqua, Ohio, as experimental engineer, having joined Westinghouse Electric & Mfg. Co., Inc., Los Angeles, as application engineer.

LT.-COM. ROBERT SANDERS, USNR, previously on sea duty, may now be reached at Newport, R. I.

ARNOLD SCHINDEL, U. S. Army, has been transferred from Camp Campbell, Ky., to Camp Shelby, Miss., where he is with the 285th Engineers, C Battalion.

CLAUDE J. BROOKS, AiResearch Mfg. Co. of Arizona, Phoenix, is now chief draftsman. He had formerly been chief checker of design and aeronautical accessories for the same company.

EMORY W. STONER, district sales manager, Haskelite Mfg. Corp., has been transferred from Detroit to Grand Rapids, Mich.

HOWARD H. DIETRICH, American Bosch Corp., Springfield, Mass., has received the position change from experimental and sales engineer to research engineer.

JOHN MacGREGOR LOGAN, field engineer for Lord Mfg. Co., has gone to the Erie, Pa., branch from the West Coast office in Burbank, Calif.

Formerly structures engineer for Curtiss-Wright Corp., Columbus, Ohio, **MARTIN HUGH FRIEDMAN** is now stress analyst for Edo Aircraft Corp., College Point, L. I., N. Y.

WILLIAM H. RIDEOUT, formerly engineering checker for Pratt & Whitney Aircraft, East Hartford, Conn., is now engineering design analyst for the company.

J. M. FARNSWORTH is now the owner of a garage in Spokane, Wash. He was formerly shop foreman, Inland Truck & Diesel Co., same city.

J. R. CLIFTON, USMCR, is stationed at the Naval Air Station, San Diego, Calif. In civilian life he was hydraulics engineer for Northrop Aircraft Co., Hawthorne, Calif.

JOHN V. BREUER, who is connected with Bendix Products Division, South Bend, Ind., has been advanced from draftsman and engineer to research engineer in the Universal Joint Division.

KENNETH J. BOEDECKER, formerly sales engineer of Wright Aeronautical Corp., Paterson, N. J., is now assistant to the general sales and service manager of the company.

Previously engineering specifications supervisor, General Motors Corp., Detroit, **EDWARD S. BARNUM** is now a draftsman, Diesel Engine Division, GMC.

WILLIAM G. ANDERSON has been promoted from assistant mechanical engineer to mechanical engineer of National Advisory Committee for Aeronautics, Cleveland.

W. G. ARMOR of International Harvester Co., Fort Wayne, Ind., has been changed from laboratory engineer to experimental engineer.

S. BERTRAND BARNARD, formerly chief engineer of the Naval Munitions Division, American Type Founders, Inc., Elizabeth, N. J., is now consulting engineer, Industrial Division of the same organization.

RAY C. ROLPH, who is associated with Willard Storage Battery Co., has been transferred from the Cleveland to the Dallas, Tex., branch.

H. T. DANIELS has moved from the Odessa, Tex., to the Oklahoma City, Okla., office of Climax Engineering Co.

R. G. WINGERTER, previously assistant chief engineer of the Industrial Bearing Division of the Canton (Ohio) office, Timken Roller Bearing Co., is now a field engineer in the Detroit Automotive Division of the company.

ROBERT REED WOODCOCK, formerly an ensign in the U. S. Navy stationed at Jacksonville, Fla., is now a lieutenant (jg) on active duty.

HOWARD A. WESTERBERG, a first lieutenant in the U. S. Army Air Forces, has been transferred from New Haven, Conn., to the 421st AAF Base Unit, Squadron A, Muroc, Calif.

S. CORWIN BRITTON, U. S. Army Ordnance Department, Plum Brook Ordnance Works, Sandusky, Ohio, has been promoted from captain to major.

THERON BRADSHAW, Perfect Circle Co., Hagerstown, Ind., has been changed from fleet engineer to replacement engineer.

G. W. BELTZ, formerly field engineer for Firestone Tire & Rubber Co., Detroit, is now automotive engineer for Firestone Industrial Products Co., same city.

WILLIAM L. BARTH, General Motors Corp., Detroit, has been promoted from standards engineer to head of engineering standards.

MARTIN FREDRICK BECKER, previously laboratory engineer for Chrysler Corp., Detroit, is now electrical engineer for the company.

HAROLD J. BALES, Boeing Airplane Co., Wichita, Kan., has been raised from assistant foreman in the tool engineering department to tool design foreman.

Formerly sales engineer for Wright Aero, Ltd., Los Angeles, **BENJAMIN RUSS ALSOBROOK** has been named field engineer of the same organization.

BERTRAM ANSELL, who is with the National Bureau of Standards, Washington, D. C., has been raised from junior chemical engineer to assistant engineer.

HAROLD F. HAMMOND, president of the Institute of Traffic Engineers and a national authority on street and highway engineering, public transit and motor vehicular transportation and traffic safety, has been appointed manager of the Washington office of the American Transit Association. Mr. Hammond leaves the post of director of the Traffic and Transportation Division of the National Conservation Bureau, accident prevention division of the Association of Casualty and Surety Executives, where he served since 1934.

WELDON E. RUGH, U. S. Army Air Forces, on military leave from Curtiss-Wright Propeller Division, Indianapolis, has been transferred from the Training Center,

Miami Beach, Fla., to Section 1, Brooks Field, Tex.

E. M. MERZ has received a medical discharge from the U. S. Army, returning to Ford Motor Co., Dearborn, where he had been previously employed, in the capacity of quality engineer.

N. B. NELSON, manager of the Chicago office of National Motor Bearing Co., Inc., has been granted an indefinite leave of absence in recognition of his many years of faithful service to the organization.

WALTER G. AINSLEY, director of engine laboratories, Sinclair Refining Co., East Chicago, Ind., is no longer a consultant for the Technical Division, Ordnance Department. Mr. Ainsley is a member of the SAE Air Transport and the SAE F&L Activity Committees.

RAY H. BRUNDIGE has been promoted from major to lieutenant colonel in the U. S. Army, and has recently returned from overseas duty.

LT. ERIC P. G. BLOOMFIELD, Navy Department, Bureau of Aeronautics, Washington, D. C., has been raised from lieutenant (jg).

ENSIGN ROBERT W. HORNBECK, USNR, may be reached c/o Fleet Post Office, New York City. He is a former student of General Motors Institute.

Before entering the service, **LT. THOMAS E. NOAKES,** U. S. Army Air Forces, who is stationed at San Marcos, Tex., had been a student of Lawrence Institute of Technology.

HARRY J. SWANSON, district engineer of E. L. Essley Machinery Co., Chicago, is in charge of a new branch office of the company in Grand Rapids, Mich. He had formerly covered Western Michigan and Northern Indiana territory.

WALTER O. CRALLE, JR., who had studied at the University of Oklahoma, is now an ensign in the U. S. Maritime Service, where he is senior third assistant engineer.

ENSIGN PAUL A. CRAFTON, USNR, may be contacted at the U. S. Naval Research Laboratory, Anacostia Station, Washington, D. C. He is a former student of the College of the City of New York.

Formerly technical instructor, Ryan School of Aeronautics, Tucson, Ariz., **EDWARD W. PYE** is now aircraft mechanic for Ryan Aeronautical Co., San Diego, Calif.

PETER ALTMAN, consulting engineer with offices in Detroit, and for a number of years head of the aeronautical engineering department at the University of Detroit, spoke before the annual meeting of the Miami Professional Engineering Society, Middletown, Ohio, Oct. 16. He discussed "Post-War Aviation," with particular reference to activities in the private airplane and air transportation fields. He is a past vice-president of the SAE.

LT.-COM. RALPH BAGGALEY, JR., who is stationed at the U. S. Navy Bureau of Ships, Washington, D. C., has been changed from senior officer of maintenance, amphibious craft engines, to assistant head of diesel engine maintenance. He is a former chairman of the SAE Pittsburgh Section.

REXFORD P. BECKWITH, formerly representative of the Cleveland Ordnance District, is now foreman of National Bronze & Aluminum Foundry Co., Cleveland.

MILTON S. WEBB, JR., a staff sergeant in the U. S. Army, has been transferred from Camp Maxey, Tex., and may now be contacted at A. P. O. 449, c/o Postmaster, New York City.

GLENN L. MORRIS, U. S. Navy, has been transferred from Princeton University to the Ninth Naval District, office of the industrial manager, Chicago.

LT. PIERRE S. DE BEAUMONT may now be reached at the U. S. Naval Aircraft Modification Unit, Johnsville, Pa. He had been at the Bureau of Aeronautics, Manufacturing Operations Section, Production Branch, Materiel Division, Washington.

ENSIGN EMERY J. SZABO, who had been stationed at Jacksonville, Fla., may now be reached c/o Fleet Post Office, San Francisco, Calif.

CHARLES H. RAY, previously contract specialist, Smaller War Plants Corp., Detroit, is now at the U. S. Engineer Office, same city.

DONALD W. ENO, formerly junior pilot for Pan American Airways System, Atlantic Division, LaGuardia Field, Jackson Heights, N. Y., is now a captain for the Latin American Division of the company, at Miami, Fla.

HERBERT AARON ELION, a former student of the College of the City of New York, is now in the U. S. Navy, stationed at Great Lakes, Ill.

WILLIAM PERRY HAHN, who had been a partner of Hood & Hahn, Indianapolis, is now affiliated with Electronic Laboratories, Inc., same city.

SERGE L. CROWELL has left Sikorsky Aircraft Division, United Aircraft Corp., Bridgeport, Conn., where he was liaison engineer, and is now with Sperry Gyroscope Co., Inc., Garden City, N. Y., as project engineer.

HAROLD VICTOR BORDEAUX, formerly welding engineer, Electrode Division, McKay Co., Los Angeles, is now the manager of his own company, H. V. Bordeaux Co., same city, manufacturers' representatives in aviation and navigation.

VIRGIL D. ACKERMAN, U. S. Navy, has just returned to this country after 22 months in New Guinea, and is now an instructor at the Packard Marine Engine School, Detroit.

G. H. ALDRICH is now associated with Engineering Service & Machine Co., New York City, where he is process engineer and group leader. He had been connected with Merz Engineering Co., Indianapolis, as tool designer.

WALTER ANDERSON is working for the Alaskan Department of the U. S. Army as operating equipment mechanic and general foreman in charge of repair and maintenance of heavy equipment. He may be reached at A. P. O. 980, Seattle, Wash.

LT. ROBERT A. COLE, AAF, has been transferred from Wright Field, Dayton, Ohio, to the special weapons test unit, Tonopah Army Air Field, Tonopah, Nev.

HERBERT B. MILLS, JR., U. S. Army Air Forces, is now at the Pre-Flight School, Maxwell Field, Ala. He was formerly engineering draftsman, National Advisory Committee for Aeronautics, Langley Field, Va.

Parts and Fittings Division at Detroit Meeting

Members of the SAE Parts & Fittings Division who met July 14 in Detroit to review and revise standards included, seated, left to right: Gustaf Carvelli, Wright Aeronautical Corp.; S. O. Bjornberg, Illinois Tool Works; A. E. Leach, Pontiac Motor Division, General Motors Corp.; W. L. Barth, General Motors Corp., and R. S. Burnett, SAE staff. Standing, left to right: H. S. Jandus, General Spring Bumper Co., Houdaille-Hershey Corp.; G. L. McCain, Chrysler Corp.; H. A. Marchant, Chrysler Corp.; W. A. Siler, Delco-Remy Division, General Motors Corp.; J. P. Breuer, Barber-Coleman Co.; R. E. Valt, National Supply Co., and C. R. Staub, Michigan Tool Co. Arthur Boor, Monroe Auto Equipment Co., is chairman.

Transport Tops

Discussion Interest at L. A. Aero Meeting

continued from p. 20

"Cruising Control of Transport Aircraft"

R. C. LOOMIS, Transcontinental and Western Air, Inc.

"Aircraft Bevel Gears"

L. J. O'BRIEN, Gleason Works

"Metallurgical Control of Aircraft Forgings"

A. J. PEPIN, Wyman-Gordon Co.

"Oil System Problems at High Altitude"

W. L. WHEELER, North American Aviation, Inc.

"The Sonigage, a Supersonic Contact Instrument for Thickness Measurement"

W. S. ERWIN, General Motors Corp.

"Application of High Production Methods to Reduced Production"

J. N. FOSTER, Curtiss-Wright Corp.

"Humidity Effects on Airplane Equipment Performance"

B. A. ROSE, Lockheed Aircraft Corp.

"The Fundamentals of Flight Induced and Forced Cooling"

J. H. BREWSTER, III, United Aircraft Corp.

"Future Operational Requirements in Relation to Cockpit Design"

M. G. BEARD, American Airlines, Inc.

All papers presented at this SAE National Aeronautic Meeting will appear in a later issue of the *SAE Journal* either in full in the Transactions Section or as digests.

tion of improved forgings and in conserving material. Close post-war cooperation between designers and forgers was recommended as a practical way to facilitate economical production of necessarily smaller quantities of forged parts.

Wartime high-production methods generally were described as applicable to peacetime manufacturing operations, provided there is general acceptance of basic plane models, and standardization and interchangeability of parts eliminate custom-built requirements. Wartime experience in building and in flying Army transport planes was reported to be aiding the accumulation of vast knowledge of how to do things under conditions never even approximated in peacetime, and as being helpful in reducing both producing and operating costs in the post-war period.

Opinion was expressed that airplanes cannot be built on the automobile's mass-production basis, although adaptation of assembly line techniques makes possible the training of workers for special jobs with resulting increases in production. This operation, however, like the use of high-speed tools and machines, was said to be practical only for prolonged manufacturing runs on one basic type of plane.

Both papers and discussions tended to support the idea that post-war manufacture of small aircraft will extend and expand civilian air travel in privately-owned planes. Large-volume production was cited as essential to price reductions which further would encourage civilian flying. Cost planning was recommended as a direct means of starting a healthy spiral of reduced prices, larger sales, and better tooling, with subsequently lowered prices.

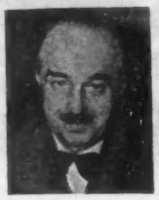
Engineers were told of the four-year development, interrupted by the war, of a small, economical civilian plane equipped with simplified controls. It was said the ease with which the plane can be flown had reduced about to five hours the time required for novices to learn to fly. The low-wing two-place monoplane was said to travel 23 miles on one gallon of fuel, to have a top speed of 117 mph, and, while itself weighing only 725 lb, to be capable of carrying a useful load of 525 lb with a baggage allowance of 60 lb.

Prolonged consideration of the problem of building passenger comfort into post-war global transport planes raised extended controversies. Moot question was whether passengers preferred comfort to speed. Some engineers proposed that the large, long-flight post-war planes should have walk-around and recreational facilities to prevent passenger fatigue and boredom. Others contended that these facilities were "frills," the elimination of which might give the planes sufficient speed to complete the flight before the passenegers became either tired or bored. Considerable attention was directed to the problems of designing plane interiors so that the maximum number of passengers might be carried on short flights without discomfort and that space might be provided for luggage.

Products Shown at Los Angeles Meeting

There was widespread interest in the Engineering Display at which 23 companies exhibited. The exhibitors were: Adel Precision Products Corp., Aeroquip Corp., Aircraft Accessories Corp., American Bosch Corp., Bardwell and McAlister, Inc., Bendix Aviation Corp., C-B Tool Co., Cleveland Pneumatic Tool Co., Ducommun Metals and Supply Co., Greer Hydraulics, International Nickel Co., Inc., Interstate Aircraft and Engineering Corp., Kelite Products, Inc., Lord Mfg. Co., Magnaflux Corp., National Screw and Mfg. Co., Oakite Products, Inc., Purolator Products, Inc., Ryan Aeronautical Co., Tinnerman Products, Inc., Tubing Seal-Cap, Inc., Turco Products Co., Wright Aeronautical Corp.

"War Lessons in Design of Accessories and Instruments"



W. A. REICHEL, Bendix Aviation Corp.

"Some New Aspects of Airline Aircraft Maintenance"

R. C. STUNKEL, Lockheed Aircraft Corp.

Co-author: "Reverse Thrust Propellers as Brakes for Large Aircraft"

G. W. MacKINNEY, Curtiss-Wright Corp.

"Coordination of Flight Deck Duties on Large Airplanes"

RALPH S. JOHNSON, United Air Lines Transport Corp.

"A Means for Warning of Incipient Breakdown of Smooth Airflow"

R. D. KELLY, United Air Lines Transport Corp.

"Four Years of Simpler Flying with Ercoupes"

F. E. WEICK, Engineering and Research Corp.

"The Design of the DC-4/C-54 Airplane"

E. F. BURTON, Douglas Aircraft Co., Inc.

Co-author: "The Design of the DC-4/C-54 Airplane"

CARLOS WOOD, Douglas Aircraft Co., Inc.

"Analytical Fuel Reserve Systems for Long Range Aircraft"

CAPT. H. J. CHASE, Pan American Airways System

Co-author: "Cost Planning the Post-War Small Airplane"

F. S. MACOMBER, Consolidated Vultee Aircraft Corp.

"Cost Planning the Post-War Small Airplane"

A. G. TSONGAS, Consolidated Vultee Aircraft Corp.

"Advantages and Characteristics of Light Metal Permanent Mold Castings"

L. F. SWOBODA, Aluminum Co. of America

"Radio Interference and the Aircraft Engine"

J. K. RUDD, Wright Aeronautical Corp.

"Reverse Thrust Propellers as Brakes for Large Aircraft"

J. H. SHEETS, Curtiss-Wright Corp.

"The Development of Spar Caps with Integral Fittings"

J. F. SCHIRTZINGER, Douglas Aircraft Co., Inc.

"A Current Outlook on the Effects of Dynamic Loads on Aircraft"

R. L. SCHLEICHER, North American Aviation, Inc.

All papers presented at this SAE National Aeronautic Meeting will appear in a later issue of the *SAE Journal* either in full in the Transactions Section or as digests.

TURBULENCE OF GAS RULES PISTON HEAT

Temperature Exchange Held Direct Function of Velocity of Flow

Technical IDEAS

Briefed from Papers

by CARL H. PAUL
Caterpillar Tractor Co.

■ *1944 National Diesel-F. & L. Meeting*

(*Excerpts from paper entitled "An Analysis of the Heat Flow into Pistons"*)

THERE are two primary means by which heat flows from gases. The first is by radiation from a luminous flame, and the second is by convection. In internal-combustion engines, it is generally believed that convection is the more important of the two processes.

Much of the heat transferred by radiation in an internal-combustion engine is transferred during the part of the cycle when there is visible flame. The radiant energy emitted by a luminous gas is a function of the partial pressure of that gas. In addition, the emissivity is directly proportional to the distance that the heat wave must travel before being absorbed in another medium, or, in our case, it is proportional to the gas volume, which is small. These points indicate the possibility that the total amount of heat transferred by radiation from the combustion gases to the piston is small compared to that transferred by convection; and it is generally believed that convection is the more important of the two processes.

Fundamental Equation

The fundamental equation, which gives the amount of heat transferred by the convection process, states that a constant temperature difference between a surface and a contacting fluid (combustion gas) causes a steady heat flow into the given area; so, in **using this equation it is necessary to assume** for the present that an invariable mean temperature difference exists between the gas and the piston at a given load and speed. The coefficient of heat transfer is merely a factor of proportionality; unfortunately, this coefficient is not easily evaluated. It is dependent on many of the physical properties of the gas and changes as these properties are altered. Since the density and viscosity of the gas change during the cycle, the coefficient is also variable. If a mean coefficient is desired, it is necessary to take the gas properties at the mean gas condition of temperature and pressure. The mean value h is a function of the gas velocity. As velocity increases, the coefficient is increased, as it decreases, the coefficient is reduced.

The amount of heat flowing into the piston is a direct function of the gas velocity over a given area. Since this velocity is a result of turbulence in the combustion chamber, **it would appear that in areas in which high turbulence occurs, more heat will be transferred into the piston crown than in other areas where turbulence is not so great.** The conclusion is that if localized heating of the crown is to be avoided, turbulence control is imperative. This would also seem to indicate that additional heat would be available for power if satisfactory combustion could be obtained with less turbulence than exists in our present internal-combustion engines.

It is possible to ascertain the mean value of h by assuming a steady-state heat flow into a given area of the piston, and saying that the heat that flows into the crown must flow through the piston by conduction. Further, if we consider an oil-cooled piston, the error will probably not be great in saying that all of the heat flowing into the area near the center of the crown will flow down through the crown and be given up to the cooling oil. This would mean that under steady-state conditions a linear temperature gradient exists across the crown within the area considered. We may write:

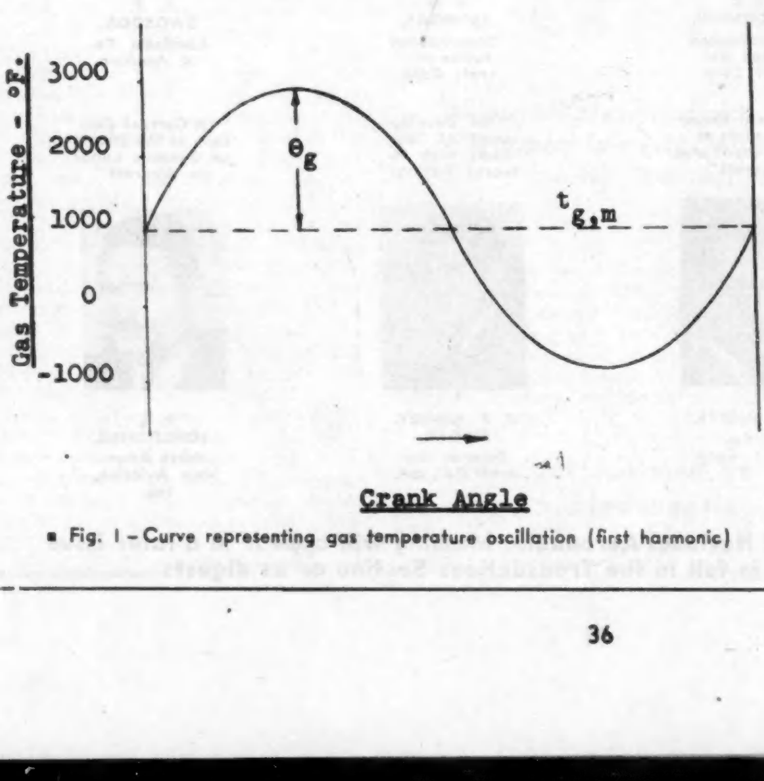
$$h = \frac{k(t_s - t_i)}{L(t_g - t_s)} \qquad (1)$$

where: k = thermal conductivity of piston material (Btu per hr-ft-F); L = distance between points in crown at which temperatures are measured (ft). Therefore, by calculating an approximate mean gas temperature t_g, and measuring piston temperature at the surface of the crown t_s and the temperature t_i at some point near the bottom surface of crown under point of measurement of t_s, the mean coefficient h may be obtained for the area near which the measurements were taken. This statement is made in view of the fact that the mean value of the coefficient probably is not constant over the whole surface of the piston because of the variation in turbulence velocities. Mean values obtained in this manner are of the order of 75 to 100 Btu per hr-sq ft-F.

Temperature Oscillations

The effect of the periodic change in the combustion gas temperature upon temperatures and heat flow in the piston is a point about which there is a great amount of misconception.

In evaluating the temperature oscillations in the piston a theoretical equation may be used that has been derived for finding the amplitude of the temperature oscillation at any point in a plane wall when the wall is exposed to a periodically changing environ-



■ Fig. 1 – Curve representing gas temperature oscillation (first harmonic)

for ENGINEERS

Given at SAE MEETINGS ★ ★ ★ ★ ★

ment temperature similar to the type shown in Fig. 1. The equation is:

$$\theta_x = \theta_g \cdot \eta \cdot e^{-mx} \cdot \cos(\omega\tau - mx - \epsilon) \quad (2)$$

where

θ_x = Temperature amplitude at any point x in the piston, F

θ_g = Maximum gas temperature amplitude, F

$m = \sqrt{\dfrac{\pi}{\tau_c \alpha}}$

τ_c = Period of the cycle, hr

$\alpha = k/\rho C_p$, thermal diffusivity

C_p = Specific heat of piston material, Btu per slug-F

ρ = Density of piston material, slugs per cu ft

$\omega = 2\pi/\tau_c$, angular velocity

$$= \sqrt{\frac{1}{1 + \dfrac{2m}{b} + \dfrac{2m^2}{b^2}}}$$

$\epsilon = \text{Arc tan } \dfrac{1}{1 + b/m}$, phase angle

$$\frac{b}{m} = \frac{h\sqrt{\tau_c}}{\sqrt{\rho C_p k \pi}}$$

It is seen that e^{-mx} is a damping factor by which the amplitude θ_x is decreased as the temperature wave travels into the crown. To obtain the maximum amplitude at any point, the cosine must equal 1, and to find the maximum oscillation at the surface of the crown, $x = 0$, so $e^{-mx} = 1$. The equation for this case becomes $\theta_s = \theta_g \cdot \eta$.

Assuming now an engine running on a four-stroke cycle at 2000 rpm with combustion temperatures similar to those indicated in Fig. 1, it is found by substituting in this equation that the temperature at the surface of the crown oscillates from 4.5 F above to 4.5 F below the mean surface temperature if the piston is made of aluminum and from 8.5 F above to 8.5 F below if the piston is made of cast iron. In either case the periodic change is extremely small, considering the temperatures involved and is negligible as the temperature wave travels into the piston.

At lower engine speeds this amplitude increases but is also quickly damped out within a short distance from the surface.

Equation (2) was derived upon the consideration that no heat was flowing through the wall. This equation assumed that wall temperature oscillated about the same mean temperature as the gas. Since heat flows through the piston, the mean crown surface temperature will be lower than the mean gas temperatures. It is satisfactory under this condition to superimpose the calculated oscillations upon the mean temperature at the point in question. A graphical representation of the case is shown in Fig. 2.

Practically, it is, therefore, seen that the periodic change in the gas temperature has little effect on any piston temperature oscillations and that it is logical to assume a condition of steady-state heat flow in the piston while the engine is operating at a given load. This means that if the heat can be removed at a constant rate, the same amount of heat will flow through the piston at all times during the cycle, regardless of the fact that an extremely high temperature exists in the combustion-chamber during a short interval in the cycle. Therefore, an equal amount of heat may be removed from the piston at any point in the cycle with the same effect as far as the piston temperatures are concerned.

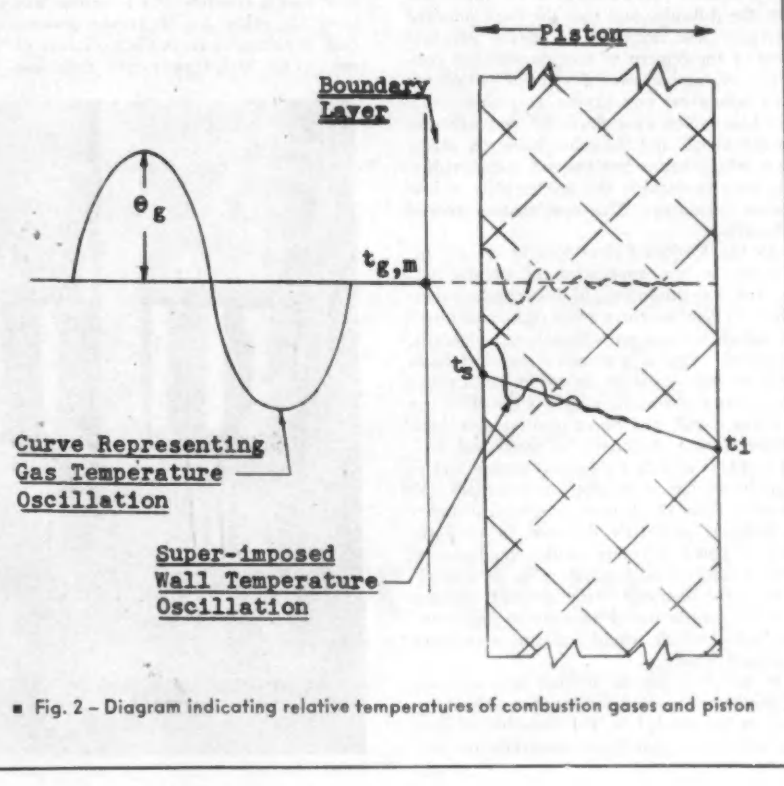
DISCUSSION

Pistons on diesel engines of the Electro-Motive Division of General Motors Corp. are made of ferrous material, according to J. P. Miller, chief of its powerplant section, who said that the heat path of the pistons is controlled by the use of a thin crown, ribbed for heat dissipation. There is a heat dam between the top compression ring and the crown in order to reduce the heat flow into the compression rings. An oil jet is directed to the ribbed underside of the crown for the removal of crown heat.

On one model of engine giving 80 bmep in railroad freight service, 0.51 lb of oil per min per sq in. of piston head area is directed toward the underside of the crown of the piston.

The necessity for this oil cooling is demonstrated by the fact that if the engine is run at rated power and the piston cooling oil supply entirely cut off, the engine will run less than 10 min before a hole is blown in the piston crown.

Mr. Miller approved of the author's remarks that turbulence control is imperative to prevent localized hot spots. In two-cycle, uniflow engines, turbulence is controlled by adjustment of the air intake port angle and piston bowl shape. Only enough turbulence should be used, Mr. Miller warned, to give proper combustion.



■ Fig. 2 – Diagram indicating relative temperatures of combustion gases and piston

Organic Adhesives Find Increasing Use As Bond For Aircraft Materials

by G. G. HAVENS
Consolidated Vultee Aircraft Corp.

▪ San Diego Group, Southern California, May 16

(Excerpts from paper entitled "Metlbond – A Metal Adhesive for Aircraft")

A RECENT and important trend in aircraft is the use of organic adhesives for bonding together metal and various other materials. The requirements of a satisfactory adhesive are shear strength, flexibility, resistance to heat and cold, resistance to aromatics and salt water, resistance to aging and to fatigue. Even after these physical needs are satisfied it does not conclude that an adhesive will compete with riveting or spotwelding. Before wide-scale use can be expected, it is necessary that the attachment with cements be not only superior in quality but also less expensive.

Consolidated Vultee Aircraft Corp., realizing the deficiencies of previous cements, undertook the development of a bonding process which would have satisfactory physical properties, and sufficiently low curing pressures so that expensive jigs could be avoided. It was believed that such a development would result in a production method of attachment which would supplement or replace riveting and spotwelding for many applications. Examination of several adhesives requiring high curing pressures showed that adhesion to the metal was not the difficulty and that the high required pressure was necessary to obtain adequate flow of the cement to provide sufficient contact. A method was developed employing two adhesives: one having a synthetic rubber base which gave flexibility and adhesion to the metal; and the other having a plastic base which had a low enough viscosity during cure to provide the needed flow at low curing pressures. This combination proved effective.

In the Metlbond development we are interested in the application of organic adhesives for producing high-strength assemblies. There are three types of known forces by which we can get adhesion of an organic to metal. One is a primary chemical bond between the metal or its oxide surface and the organic chemical, which is the strongest type of bond and most resistant to high temperatures. Another, the interstitial type of bond, is also of a chemical nature and is usually explained as due to secondary valences. The third type, mechanical interlocking, is ordinarily deficient in strength, and its power depends on the roughness of the surfaces to be bonded. The best Metlbonds are obtained with smooth surfaces and are comparatively resistant to high temperatures, which would indicate a primary chemical bond.

It was necessary to develop several forms of Metlbond to meet the large variety of requirements needed in the assembly of production items. Metlbond materials are prepared in liquid, paste and tape forms; spraying, brushing, spreading and tape methods of application are used. Some recently developed types are:

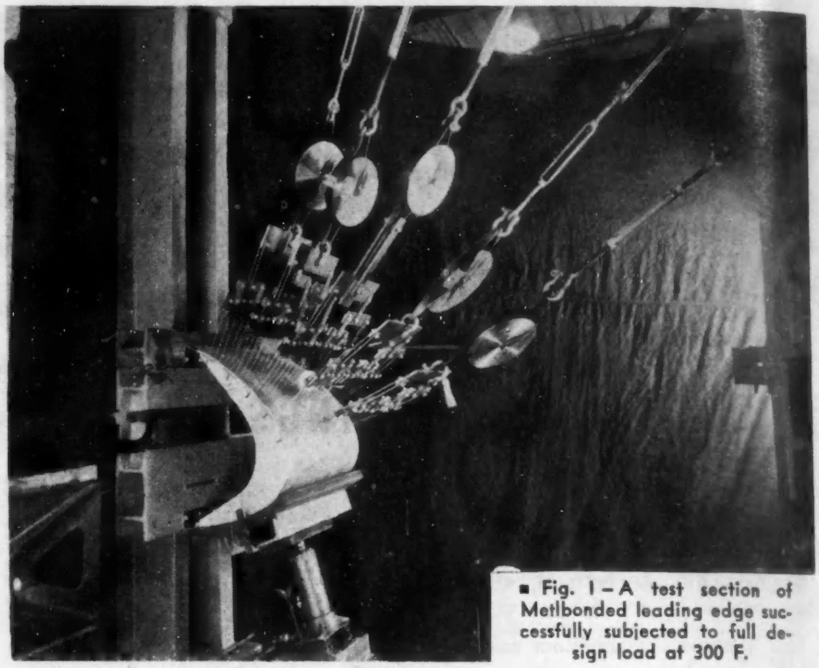
1. The original high-pressure, high-temperature, single-phase synthetic rubber base requires 100 psi curing pressure at 330 F for 20 min. The adhesive is sprayed onto the parts to be bonded.

2. A low-pressure high-temperature two-phase Metlbond requires 15 psi curing pressure at 300 F for 20 min. The synthetic rubber component is sprayed and a plastic component brushed onto the parts to be bonded.

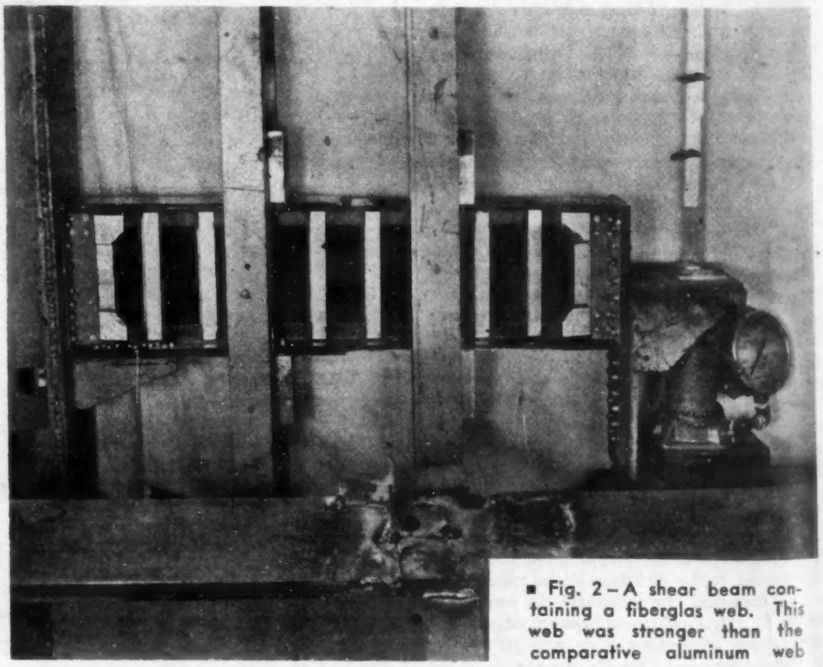
3. Two types of tape have been developed. One which requires 250 F curing temperature; the other 330 F curing temperature, both requiring a curing temperature of 100 psi. The high-temperature type has the highest shear strength and best heat resistance, but is not satisfactory where the parts contain certain organics unstable at 330 F.

4. A very low-pressure high-temperature Metlbond has been developed requiring a curing pressure of 1 psi or greater, and a curing temperature of 330 F. The shear strength of this type is approximately two-thirds that of the first two types.

Although the above Metlbonds were developed principally for metals, they also can be used for most solids. The Metlbonding of some materials requires special procedure. The bond between synthetic rubber Metlbonds and glass fails when subjected to prolonged sunlight. To avoid this the plastic type of Metlbond is used next to glass. On the other hand, the adhesion of the synthetic rubber Metlbond to transparent thermosetting materials seems to be unaffected by sunlight.



▪ Fig. 1 – A test section of Metlbonded leading edge successfully subjected to full design load at 300 F.



▪ Fig. 2 – A shear beam containing a fiberglas web. This web was stronger than the comparative aluminum web

An example of the use of Metlbond for new applications is the aluminum fiberglas sandwich, in which one or more layers of high-strength fiberglas are bonded between two layers of aluminum. This results in a sheet composite of superior stiffness and tensile strength when compared to aluminum alloys on a weight basis. More important still are its sound deadening properties. Applied as skin to the fuselage of an airplane, the reduction in drumming noise is considerable.

Another example is the attachment of plastics such as plexiglas to aluminum. The Metlbond is sufficiently flexible to allow for the difference in thermal expansion of aluminum and plexiglas. Also, experiment and theory have shown that it is possible to bond steel, up to ¼ in. thicknesses, to aluminum even though the thermal expansion coefficients of these metals differ appreciably. In this case, the Metlbond also serves as an insulator to prevent corrosion between the different metals.

Plastics, dies, jigs and fixtures are susceptible to breakage in handling in the factory. This tendency can be greatly reduced by Metlbonding steel sheets to the plastic surfaces.

. . . . . . *VIGILANCE*
In Observation, Record Keeping, Is Fundamental To Vehicle Maintenance

by EDGAR B. OGDEN
Consolidated Freightways, Inc.
■ 1944 National West Coast T&M Meeting

(Excerpts from paper entitled "Preventive Maintenance, A Necessity")

WE have been practicing preventive maintenance since 1929, and have worked out the following program on the subject:

An accurate record of all failures must be kept in order to tell what particular part is causing the most trouble, as far as road failures are concerned. We have a form that road mechanics must fill out which gives a description of the failure. These failures, which are computed each month and at the end of each year, are broken down on a mileage basis to determine how many miles per road failure we are averaging. Thus, it is often found that some part is giving too much trouble, and the remedy may be to check parts more often or to substitute a different part.

It is absolutely necessary to keep the water cooling system in a clean condition. This can be accomplished by watching the circulation in the radiator with motor running at high speed. Also, by looking into the top of the radiator one can often see that part of the tubes are plugged with foreign matter. If the stoppage is not too severe, it may be opened with a good radiator flush compound, but if it is too bad, we remove and rod out the tube.

By use of the magnaflux method, we have virtually stopped all motor failures due to broken pistons and connecting rods. We have also overcome to a large extent sticking of the piston ring by the use of a keystone ring in the top ring groove. As the ring wears it becomes looser in the ring groove, which keeps the ring from sticking, and due to its tapered edge, the ring tends to centralize and stabilize the top of the piston in the cylinder.

We have done two things to increase the life of the aluminum piston. First, we have secured a keystone ring 0.010 in. wider than standard, which allows us to machine the top groove true again. Second, we have cut the top groove out to 5/32 in. and used a straight ring in place of the keystone. The former is the more satisfactory method, however.

A little time should be spent to get the injector timing set correctly. Due to the construction of lower valve lifter rockers, it is possible to change the timing a few degrees by moving the rocker assembly toward or away from the cam shaft. This can be accomplished by the use of different thickness gaskets, and a special jig which we made up can check it in a few minutes. Factory recommendations are that injectors should start to travel on the injection stroke at 49½ deg before top center. As it is difficult to read the dial indicator at the exact starting point, we do all our setting from 30 deg before top center. At this point the cam

must have traveled not less than 0.019 in. and not more than 0.021 in. on the discharge stroke. A tolerance of 0.002 in. is permissible, as it will change the timing less than 1 deg.

As the cam shaft usually breaks down on one injector cam lift first, it is possible to reuse the old shaft with good results if the timing is set up properly on the worn cam by adjusting with special length arms on the lower rocker assembly.

Regarding bearings, we are using copper-lead 100% in all supercharged motors at present, and are changing over to them in conventional motors. Although a greater amount of crankshaft wear takes place with these bearings, their advantages outweigh the disadvantages.

In order to keep the motor as clean as possible at 10,000-mile intervals, we flush the engine for 30 min at a motor speed of about 1000 rpm on diesel fuel with two quarts of motor oil added to the diesel fuel. We also spray the sludge out from around the valve stems and wash this down into the oil pan. Before doing this, it is suggested the oil filter cartridge be removed and left out. If an auxiliary filter is used, shut it off or leave the cartridge out of it, as the flushing oil may loosen up most of the dirt in the filter and send it back through the motor.

There are many pros and cons regarding the use of brake shields, but we have found them effective in keeping dirt out. Our brake lining life is about 175,000 miles, while with shields off at least 50% of the life is lost. They have also prevented brake-drum scoring.

We have had no trouble with the needle bearing Brinelling into the brake cam in 300,000 miles of service. Our maximum brake pressure on these jobs is 60 lb and 30 lb are all that are necessary for average stops. With this low application pressure, we have no brake drum breakage with the drums "bell mouthing."

A brake lining grinder of a type that fits on to the axle tube and grinds the lining to the exact circle of the drum should be used. This will eliminate the wear-in period of the lining, and it is during this period that much lining is burned up in spots.

General appearance of the equipment and condition of cabs and seats are very important. Some time in the future, I hope to see each truck and trailer washed before each trip and the cab cleaned out thoroughly. I am sure this would pay in the long run.

EFFICIENCY...... Of Oil Cleaner Vital Factor in Prolonging Life of Engine, Parts

by CECIL BENTLEY
DeLuxe Products Corp.

▪ 1944 National West Coast T&M Meeting

(Excerpts from paper entitled "Relation of Lubrication and Filtration to Engine Life")

THE oil filter has long been recognized among lubrication experts as an important aid in obtaining better lubrication,

longer engine life, longer trouble-free engine use, and lower overall operating costs; yet, there has been considerable misunderstanding as to the ranges of usefulness and limitations of the various filters.

An oil film is a mass of molecules composed of 85% carbon and 15% hydrogen; however, when subjected to scorching engine heats and exposed to combustion gases, breakdown occurs and oxidation proceeds to form asphaltenes, resins, and oil acids.

One of the sources of asphaltenes and resins are unburned heavy ends of the fuel. Crankcase oil usually contains a small amount of dilution, the amount varying with the outside air temperature, the engine, its condition and service. Since unburned fuel has been subjected to the blast furnace temperature of combustion, it is highly oxidized.

Abrasive materials can quickly sabotage the finest engine and their quick removal is an absolute essential if long engine life is obtained. Efficient air cleaners have done much to reduce the amount of abrasives entering the combustion chamber through the carburetor, but as long as engines are built with non-protected holes and are not kept meticulously clean, the oil filter will be the prime factor in abrasive removal.

Correct diagnosis of the used filter cartridge can be of utmost importance to the careful operator since it frequently reflects unusual engine conditions. We have divided cartridge conditions into the following groups:

Distress Signals – These reflect distressed conditions which require immediate attention. One cartridge shows low temperature sludge, another shows high temperature sludge, and a third shows a collapsed cartridge.

Cold Running Engine – Such an engine normally causes severe sludging, in which case the filter cartridges are rapidly loaded and heavy sludge deposits are found throughout the engine.

Faulty Engine Adjustments – When the carburetor is out of adjustment the filter cartridge appears mushy, is light in weight, and the top is loose and flabby. Also, when blowby is excessive, the filter cartridge is soggy and heavy, it has a bad odor, and the top is not filled out. Finally, when the engine is running too cold, the filter cartridge has a glazed appearance, it frequently shows moisture and acids, and is poorly filled.

Filter Neglect – This neglect usually takes two forms: (1) The filter cartridge is limited in size and must be changed when it is loaded regardless of time interval or mileage. After the cartridge becomes fully loaded, the oil begins to build up in contaminants and the succeeding cartridge has a housecleaning job to do before normal conditions can be resumed. (2) The filter sump is a catch basin and must be cleaned each time a cartridge is changed. Failure to do this may result in its filling to the point where cartridge efficiency may be impaired. Periodic drainage is desirable when the crankcase oil contains water.

Correct Operation – When operation is correct, the filter cartridge has a well-rounded top, is clean externally, and is firm.

Characteristics of a Good Oil Cleanser

1. All parts of the cleanser should be inert to the oil. In this respect pure cotton has been found to be the best material. Filtering earths used in refining mineral oils

cannot be used as they also remove oil additives necessary for detergency and/or oxidation stability. Also, no treating chemicals or neutralizers should be added as they may react with the oil to form harmful byproducts or to nullify the refiner's efforts.

2. A good oil filter should be an integral part of every engine. If it must be attached as an auxiliary, however, it should be mounted on the engine to minimize the effects of vibration.

3. The filter and its necessary plumbing should be sturdily constructed to withstand high oil pressures, metal fatigue and vibration.

4. The filter should be equipped with a sump so that heavy particles and water can settle out and not unduly load the cleansing medium. The sump should also be cleaned each time the filter cartridge is changed.

5. The filter should have an adequate capacity for reasonable service life, and it should be able to keep oil insoluble material from accumulating in the oil. It should be able to remove the smallest oil insoluble particles as well.

6. The filtering medium should remain unaffected by service requirements giving fairly uniform cleansing action throughout its normal life.

7. Since the oil filter is connected to the engine oil pressure system, a provision must be made to avoid oil pressure drop. Properly metered inlet orifices are the most commonly used methods of preventing pressure loss. It is of equal importance to control oil pressures within the filter to prevent pressure surges from washing the filter element.

Limitation of Filters

1. Filters cannot extend oil life. It can only maintain the oil in a condition whereby maximum oil life in service can result.

2. Filters are useless and uneconomical for operations where engine temperatures are very low and blowby is excessive.

3. Filters cannot cure faulty engine adjustments.

HYDRAULIC...... Controls on Aircraft Relieve Pilot, Add to Efficiency of Flying

by H. ALEXANDERSON
Eclipse-Pioneer Division,
Bendix Aviation Corp.
■ 1944 National Aeronautic Meeting

(Excerpts from paper entitled "Hydraulic Engine Power Controls")

VARIOUS controls have been developed to relieve the pilot of many of his former mechanical duties and which permit the engine manufacturer to select for him automatically the best combinations of manifold pressure and propeller governor setting for any set of conditions, the pilot still retaining full manual control for emergency operation or for particular power requirements. The following outlines engine power control by means of hydraulics:

The prime function of the hydraulic engine power control is to select engine speed by positioning the propeller governor and to select and maintain manifold pressure by automatic control of the carburetor throttle. Speed and manifold pressure selection must follow a predetermined program, and limitations of speed and pressure in combination are incorporated in the program.

Manual control is provided for idling, power below minimum cruising power, engine starting, and emergency due to either oil pressure failure or malfunctioning of the control circuit. By a secondary control, selection of cruising power manifold pressure versus engine speed is provided. In specific cases, where selection of mixture control position can be correlated with the power program, automatic positioning of the mixture control lever is accomplished. Where the throttle loads are high, and when added to the loads incident to selection of speed and pressure so that the loads would result in undue pilot effort, then the hydraulic control provides force buildup.

The hydraulic engine power control is adaptable to direct engine application where the installation has been designed into the engine itself. When the proper pad is provided, the control becomes a part of the engine and the combination is no more vulnerable than the engine itself. All oil and

air passages are internal; the connection from the carburetor throttle to the control is short and direct. Similarly, the connection to the propeller governor becomes a part of the engine. Synchronization of the propeller governor with the power control is easier and subject to the least error. The engine oil pressure system provides the power to operate the control, oil to damp vibration of the more sensitive elements, and lubrication. These features are inherent with the hydraulic mechanism.

Where a pad is not available, the control is always mounted near the engine. Due consideration must be given to the routing of the control linkage from the power control to the carburetor throttle and to the propeller governor to minimize the effect of engine movement. The manifold pressure line is kept short and direct to prevent lag which can result in overshooting or hunting. In some cases, however, some restriction is provided to damp out manifold pressure pulsation. Particular care must be given to the routing of the oil pressure and oil drain lines.

While this type of installation is less advantageous than direct engine mounting, the major part of the linkage mechanisms becomes a part of the engine itself, and the connections to the control proper are simple and direct.

A small amount of oil is bled through the control to prevent congealing and sluggish operation under cold-weather conditions. The oil flow required varies from 1 to 4 lb per min. When properly controlled, the hydraulic engine power control is no more affected by cold or heat than the engine itself. Operation of the oil dilution system serves equally to dilute the oil in the control and in the oil lines, although sufficient operation of the engine after dilution to dilute the oil in the control is required.

Hydraulic engine power control, because it is an integral part of the throttle linkage system, is arranged to provide direct manual control of the throttle during engine starting, or in the event of oil pressure failure. As the hydraulic control receives its power from the engine that it controls, it is obvious that a failure of the power source implies an early or immediate shutdown of the engine. Hence, failure of the power source does not create an additional failure or hazard. Sufficient throttle movement is provided to obtain normal power at maximum engine speed at sea level.

Hydraulic controls are simple. The selector mechanism generally is composed of easily understood pin-jointed linkages, and the power linkage is similarly constructed. These controls also give long service life. Generally, no attention is required between major engine overhaul periods other than for inspection of connecting linkage, mounting or tubing connections, the constant flow of oil providing lubrication, damping of bellows vibration, and minimizing wear.

The hydraulic engine power control, when applied directly to an engine, offers a compact and rugged system of low vulnerability. Where remote operation of sensing or actuating means are required, various elements of the hydraulic control can be advantageously combined with electric or electronic units.

Hydraulic units offer a simple and direct solution to the many problems of coordinating engine functions into reliable automatic controls providing protection to the engine itself, and still permitting complete manual operation when desired and emergency power when necessary.

Selection of Bearing Material Determined by Service Needs

by R. A. WATSON
Federal Mogul Corp.
▪ Salt Lake City, April 5

(Excerpts from paper entitled "Bearing Materials, Their Field of Usefulness and Application")

THERE is no universal bearing material good for any and all installations. Each available material has its own field of usefulness, and it must be used within the limitations of that field if optimum bearing performance is to be obtained.

Dry Surfaces

Journal and bearing surfaces may be noticeably rough to the touch or naked eye, and when dry, these roughnesses engage

with one another and resist motion. This causes power losses, wear and heating under load.

Complete Oil Film

As the clearance space between the journal and bearing is not uniform but of a tapering or wedge-like shape, a supply of oil sufficient to keep this space filled results in an oil wedge. The rotation of the journal will cause oil in this wedge-like space to be carried towards the film in the area of closest contact, thus building up pressure in the oil film, and tending to separate the surfaces. This oil wedge is of great importance in attaining the highest degree of lubrication. With a complete oil film separating metal parts, wear ceases and resistance to motion is only due to the fluid friction within the film.

To minimize fluid friction, oil should possess the lightest body that will safely maintain a complete film under existing conditions of load, speed, and temperature.

Film Temperature

Although the lubricating film is microscopic in thickness, it is composed of outer layers cooled by contact with metal, and inner layers heated by the internal friction within the fluid. The tendency is for the central layers to be of higher temperature, due to the heat generated therein. An increase in temperature always reduces viscosity or body, rendering this part of the film more fluid. This causes a greater part of the motion to take place between the central layers, localizing fluid friction in this part and tending to increase the temperature difference between the layers until a stable condition has been reached.

Causes of Incomplete Oil Film

Low speed of operation is a common cause of incomplete oil film. Heavy bearing loads tend to reduce film thickness and may cause contact of surfaces. At moderate or high speeds, such contact produces rapid heat generation and leads to bearing destruction. High temperature of operation due to hot surrounding conditions reduces oil body and decreases the supporting power of the oil film.

Corrosion and Bearing-Surface Deposits

With the introduction of copper-lead, cadmium alloys, and one of the hardened lead-alloy bearings for use in engine bearings, came bearing-surface corrosion, an affliction which does not affect tin-base babbitt or most of the lead-base babbitts. When corrosion exists, probably the most outstanding symptom is surface discoloration.

Considering copper-lead bearings, it is possible to catalogue three types of surface deposits which affect their surface color.

Type 1 is a hard, bright, shiny, oily, black surface which starts in an orange color, ages into brown, and finally into black. This is readily removed by immersion for 15 to 30 min in a boiling solution of Oakite No. 29 and water, using 10% of Oakite by volume.

Type 2 is a soft dull-black deposit resembling dried out or compressed sludge. The deposits usually are not uniform over the bearing surface, and the condition can often be associated with the use of highly detergent oils in an old engine. This can be removed satisfactorily by the immersion treatment.

Type 3 is a hard dull-black deposit (lead and copper sulfide) which is definitely associated with corrosion, and which may cover the entire bearing surface or only parts of it. The blackened surfaces are covered by small pits or cavities which were originally occupied by lead. The lead has been attached by certain petroleum acids formed in the lubricating process, leaving a porous copper structure which eventually breaks down. The formation of these harmful acids is usually the result of excessively high-temperature operation.

A similar condition of corrosion may be obtained by the use of incompatible oils which are originally compounded with certain fatty acids. Another cause of minute surface pitting and lead loss is extremely high temperatures at the bearing surface whereby the lead is simply melted out. Still another condition is the attack of other types of acids which may be formed under conditions of low-temperature operation, heavy blowby, poor crankcase ventilation, and excessive idling. This attack is directed against

the copper in the bearing rather than the lead.

Rules for the Installation of Bearings

1. The crankshaft must be of adequate hardness, and there must be ample radial oil clearance. Ample end clearance at the thrust bearing must also be obtained.

2. If interchangeable (precision) type main bearings are to be used, the crankcase bearing saddle bores must be round within 0.002 in. and in the true alignment to the extent that an aligning bar ground 0.00075 in. under the case bore diameter can be turned by hand with the aid of a 15-in. pipe extension after the caps are tightened down over the bar. If out-of-roundness exceeds 0.002 in., the bearings must be finish-bored to the correct size in the rods.

3. Avoid cap misalignment sidewise by using wrench sockets of the proper diameter, and tighten all bearing bolts and nuts with a torque wrench to uniform settings.

4. Oil gage pressure must be up to original specifications.

5. Engine water jackets, radiator, and hose connections must be free and open to insure normal cooling water temperatures.

6. If a reground crankshaft is used, the journal and crankpin surfaces must be ground and lapped.

7. All engine oilways must be thoroughly cleaned out.

8. Connecting rods must be in correct alignment.

9. Coat the surface of a new bearing liberally with a heavy engine oil and also the crankshaft surface at assembly.

10. Select a lubricating oil on the basis of competent engineering advice.

11. Break in a rebuilt engine with the same care as a new one.

.... ACCESSORIES
Parallel in Importance To Engine in Motor Bus

by W. W. CHURCHILL
Washington Motor Coach Co., Inc.

▪ 1944 National West Coast T&M Meeting

(Excerpts from paper entitled "Surface Buses of the Future")

THE engine, without question, is the most important unit in a coach, and regardless of the type of engine used, either diesel or gasoline, there are several accessories that are quite as important. They are:

1. A centrifugal governor designed for accuracy and reliability. Incorporated within the governor should be a device, such as a buzzer, to warn the driver when the engine overruns.

2. Oil filter of adequate size. It should be directly attached to the engine in order to eliminate the necessity of any oil lines or flex tubes, which are an added failure hazard.

3. A well-constructed low oil pressure indicator directly attached to the engine and connected to a warning light or buzzer adjacent to the driver.

4. Engine temperature indicator connected to a buzzer warning the driver when overheating develops.

5. Engine tachometer with the indicator placed within the driver's vision.

Axles – In the later heavy-duty coaches axles have given satisfactory service, and in view of the loads they must carry, we can look for little change in them until different metals are developed.

Transmissions – The trend is to semi-automatic and full-automatic transmissions.

Clutches – A clutch properly designed for a given engine, transmission, rear axle and coach should have a lining life equal to the life of the engine between overhaul periods. From practical experience it is found that the same size clutch will not have the same lining life in two jobs of identical size and weight with the same engine, but having transmissions of different ratios.

Brakes – Power brakes now available have proved generally satisfactory, especially in the later coaches; however, as road speeds

turn to p. 49

APPLICATIONS Received

The applications for membership received between Sept. 10, 1944, and Oct. 10, 1944, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section: Frank Iannuzzi.

Buffalo Section: Charles Vernon Brack, Everett Charles Curtis, Jr., Erik H. Halvarson, Camille Robert Lemonier, Dorian H. Sanders.

Canadian Section: Sydney D. Ballard, L. H. Kain, Roy A. McVey, Francis R. Russell.

Colorado Group: William R. Calligan, Jr., Chauncey W. Olson, Edward Joseph Pieters.

Chicago Section: Walter W. Black, Harold William Browall, James W. Brown, Edward Frank Cygan, Elmer A. Domes, Walter Lawrence Dray, Criss Weston Franz, Leonard J. Koch, John R. LeVally, J. M. Morrow, Francis W. Murphy, Kenneth S. Oakley, Joseph H. Reed, Palm E. Reichelt, Frank Shanahan, G. S. Staunton, Herbert Hugo Weiss, Zeb Wesolowski.

Cleveland Section: Donald A. Barnes, Theodore R. Fredrickson, John J. Gaydos, Raymond E. Greenough, John B. Meigs, Emil R. Mokren, Milton Stahl Roush, Fred Warren, John G. Wilson.

Detroit Section: William M. Alexander, Joseph C. Andreini, Werner G. Baule, Arthur C. Berg, Frederick V. Bott, Robert D. Buick, James Leonard Burnham, Harold Harrington Bush, George V. Candler, Jr., Clifford H. Dixon, Jack R. Doidge, Walter C. Doutt, William Warren Dronberger, Loren C. Edman, James W. Harnach, Merritt D. Hill, Raymond J. Hodgson, Leroy A. Howard, A. R. Ketcham, Harry P. Lewis, William S. Logan, John J. May, Jack Dempsey McNamer, Halbert S. Martinson, H. Richard Matheny, Harold Moore, Robert Elwood Onley, William L. Park, Harvey Harold Pollack, Ralph S. Ragsdale, William F. Rapelje, Jr., Maxwell E. Salisburg, Samuel Samarel, Robert W. Saylor, Arthur L. Schultz, J. Milton Shatzel, George R. Smith, Carl D. Stephenson, James B. Streator, Frank Ready Swaney, Jr., Rex A. Terry, John Patrick Tully, N. K. Van Osdol, Chester G. Venditty, Robert A. Wiggle, Sheldon F. Woodard.

Kansas City Section: J. D. Bowersock, John A. O'Connor, Harold F. Twyman.

Indiana Section: Charles W. Messersmith, Ralph A. Shelly, Brooks H. Short, Herbal A. Thornburg.

Metropolitan Section: Umbert G. Baldassarri, Arthur Joseph Clark, Jr., Rocco L. Cuzze, Robert M. Durham, Irenee duPont, Jr., Theodore A. Endresen, John F. Giovannetti, Edward P. Grubel, R. Thomas Halstead, Raymond P. Heron, Robert William Houska, Donald S. Johnson, Edward Kalustian, William Martin Kauffmann, Joseph Koelbl, Jr., Patrick J. Meade, Richard W. Shanklin, Francis Smulders, Harvey Ladew Williams.

Mid-Continent Section: John William Basore, John Leon Brogan, Jr., Ed. Reily.

Milwaukee Section: Farrell D. Biddle, L. H. Christiansen, Charles W. Finkl, John T. Jarman, Earl H. Kidd, James M. Leake, W. W. Schettler.

New England Section: George P. Wilson.

Peoria Group: Charles M. Bossong, Frank A. Grooss, Harold R. Johnson, Robert

V. Larson, Walter J. McCulla, Paul Vernon McWherter, R. C. Williams.

Northern California Section: Frank V. Beck, Lt. (j.g.) Thomas Francis Burke, Gerald T. Grace, A. J. Larrecq, Lt. (j.g.) Howard P. McJunkin, Lt. James P. McSweeney, Lt. Robert Saunders Stoops, Ensign Richard B. Tyler, Leonard Velander, Jr.

Oregon Section: Lt.-Col. Marlboro Kimmel Downes, J. H. Howell, Leighton W. Johnson, John Stanley Poulson.

Philadelphia Section: John Charles Black, Martin Gilman, Ensign Glenn Edward Herz, Lewis C. Kibbee, Roy F. Leiner, Albert C. Soderlund.

Pittsburgh Section: Harry C. Bennink, J. I. Byers, Richard W. Vaughn.

St. Louis Section: Joe A. McCartney, Archie Knox Miller.

Southern California Section: John Michael Alder, Kaj Bagge, Theodore Dwight Buettell, Milton Feinberg, James W. Gaines, Larry J. Halderman, Henry G. Howell, K. R. Jameson, Howard H. Jefferies, Robert Golden Koger, Albert Lester, Jane Little, Loyd Van Lovell, Lloyd Gerald Ludwig, Leonard Mandell, Eugene Michalczrk, John H. Newby, Robert O'Hanlon, Wilber C. Oliver, Vernon L. Peterson, Aubert M. Rice, Jr., John H. Senter, Aubrey Shonberg, William Herbert Snow, Earl G. Spangler, Capt. Benjamin Van Doren, Jr., Reuben Wolk.

Southern New England Section: James Edward Dimmett, Wilbur C. Fletcher, Rudy Allen Hurlston, Richard William Husher, Jr., Edward Louis Koenig.

Southern Ohio Section: Otto D. Gscheidle, Helen K. Hoskinson, George W. Heck.

Spokane Group: Leslie B. Heywood, Lawrence Ray Miller.

Syracuse Section: Robert Irving Buckalter, Wallace J. Squire.

Texas Section: Gene P. Cooper, James George Marsh, Lt. Robert L. Stephens.

Twin City Group: Martin Ronning.

Washington Section: Edward R. Ballash, Ralph Frank Broberg, David Feigenbaum, Ernest F. Fiock, W. A. Gresh, Henry Smith McKann, Richard M. O'Boyle, Alex Petrovsky, A. Burks Summers.

Outside of Section Territory: Edward Burrowes Goodwin, Pvt. Leon E. Greeley, John Francis Hohl, John S. Kohat, Ensign Ralph H. Long, Jr., Roger Clement Naylor, Frederick W. Recknagel, Robert D. Rinehart.

Foreign: Alan Bray Lindley, New South Wales; Henry Wallis Noble, England; Lt. Eric Frederick Priest, South Africa; W. J. Rawnsley, Australia; Peter Reid, India; Major Frank Walker Smith, England; Capt. William Michael Hugh Stevens, England; Gerald Richard Taylor, England; Joseph Henry Temple, England; Gordon Heatherton Vokes, England.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Sept. 10, 1944, and Oct. 10, 1944.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: Walter F. Kneip (A), Edward E. Minor, Jr. (M).

Canadian Section: Charles H. Abray (A), Fredrick G. Adams (M), Frederick R. (A), Ralph A. Desmond (A), George Wilhilson (A), Harold Thomas Humby (M), Kenneth L. Morris (M).

Chicago Section: Hosmer H. Allyn

liam Ely (J), Clifford Lysle Haseman (J), John C. Hayden (M), Jacque Louis Meister (J).

Cincinnati Section: John V. Rettig (M).

Cleveland Section: Richard C. Adams (A), John W. Bandusky (J), William B. Buckman (J), Emery G. Gilson (M), Paul R. Guerin (M), Donald A. Hendricks (A), Capt. Tsui-chu Mao (J), Theron T. Thompson (M).

Detroit Section: Norman L. Boxwell (A), Ernest D. Bushong (A), Carl A. Carlson (A), Donald C. Douglas (M), H. R. Eshleman (A), T. W. Flood (A), Glenn H. Hicks (M), Clayton R Lewis (M), Arthur MacNall (M), Archie R. McCrady (A), Archie D. McDuffie (M), Warren M. Merrill (A), John C. Monahan (M), Edwin B. Munson (M), Thomas H. Oliphant (A), John L. Palmer (J), Frank W. Rising (A), Clyde L. Ryan (A), W. Eric Wilson (M).

Indiana Section: Philip B. Lovett (J), Hamilton L. McCormick (M), 2nd Lt. Walter E. Rafert (J).

Metropolitan Section: George Kerr Anderson (M), S. C. Atkins (M), James T. Coliz (J), Charles E Conover (M), Burns Darsie, Jr. (M), H. G. Denham (A), Howard J. Diehl (M), John V. Dunn (A), Lars Niclas Enequist (A), Louis H. Enos (M), John Gitz (M), George D. Holdsworth, Jr. (A), Frank W. Laurenson (J), Teng mei Lee (J), John Thomas Lipford (J), Stanley Maas (J), Richard J. Pietschmann, Jr. (A), Alfred Richard Puccinelli, Jr. (J), Nathan Shapiro (J), Oscar F. Soetbeer (M), Alfred Sonntag (M), Charles Carroll Sons, Jr. (J), James George Turton (M), Edward F. Wohlers, Sr. (M).

Mid-Continent Section: Joe M. Cowan (A).

Milwaukee Section: Austin Gudmundsen (M), J. V. Resek (M), John L. Ryde (M), Elmer R. Schroeder (A).

New England Section: Lewis B. Ebbs (A), Nicholas Grossman (J).

Northern California Section: Joseph T. Cieszko (J), Ensign Gerald R. Wynne (J).

Northwest Section: Henry T. Robertson (A), Turco Products, Inc. (Aff.), Rep: Edward J. Brodersen.

Oregon Section: Earl Andersen (A), E. A. Littrell (A), Edward C. Wagner (A), Merion Young (A).

Philadelphia Section: George P. Henderson (A), Lt. Brent C. Jacob, Jr. (S M), John K. Killmer (M), George J. Murphy (A), Yale & Towne Mfg. Co. (Aff.), Reps: Samuel W. Gibb, Carl H. Moeller, Charles S. Schroeder.

Pittsburgh Section: Walter Lewis Keene (M).

St. Louis Section: Louis L. Wilson (A), William S. Wilson (J).

Salt Lake Group: Frank G. Backman (A), W. J. Phillips (A).

Southern California Section: William Argyle Clegern (M), Elmer H. Cook (J), Charles E. Gaugh (A), William Travis Green (J), Robert R. Justice (A), Thomas B. Keenan (J), Ross Nichols (A), J. Homer H. Overholser (J), Fred Rudolf Reczuch (A), Geo. W. Smith (A), Austin F. Trumbull (M).

Southern New England Section: Henry C. Ashley (M), Charles A. Baresch (J), George F. Hagger (J), Carl Fredrick Johnson, Jr. (J), Roland A. Labine (A), John Richard Leon (J), J. D. Lostritto (A), Harry C. Nissen (M), Leonard Arthur Sexton (J), Sumner L. Young (M).

Southern Ohio Section: H. Yale Mageoch (M), Philip T. Sealey (S M), Lt. Evans L. Slater (J), H. Roger Williams (J).

Spokane Group: Glenn Oliver Patchen (M), Edward C. Slatky (A).

Syracuse Section: A. A. Bradd (M), Thomas B. Frame (J), Theodore A. La Brecque (M).

Texas Section: Otto August Genzel, Jr. (A), Gerald William Keller (J), William C. Stewart (A), John T. Wade (A).

Twin City Group: F. H. Funke (A), David M. Little (M).

Washington Section: Carlos R. Bell (J), James H. Carmichael (M), C. Bedell Monro (A), C. Austin Sutherland (M).

Western Michigan Section: Frank McGowen (J), Richard James Roth (J).

Outside of Section Territory: James George Alexander (J), Lt. Paul Joseph Bauer (A), Harold (Hal) Gustav Johnson (J), James Frederick Smith (M), Frederick W. Tucker (A).

Foreign: Charles Dunstan Brewer (F M), (England), Walter Sydney Dack (F M), (England), Harold William Hogben (J), (England), John Francis Johnston (A), (New Zealand), Walter Steuer (F M), (England).

Accessories Parallel Engine in Importance

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increase brakes must be improved still further. Several necessary improvements are: better braking ability, longer lining life, cooling of the brake drum, higher quality brake drum material metals, and the elimination of hot brake drums burning up inner dual tires. Connected to the brake air pressure system should be a low air pressure indicator connected to a buzzer adjacent to the driver.

Chassis – Most coaches built before 1941 were integral body and chassis, which will permit stronger and more flexible construction for the future.

Body – Designers should develop seats with space underneath for limited pieces of baggage. The greatest possible improvement for passenger comfort, and one which would not interfere with safety, would be coaches built 100 in. wide, rather than the present 96 in. width. I recommend also that each double seat be increased 1½ in. in width.

Metal construction is undoubtedly here to stay, and I believe the use of aluminum will be increased in body construction. Plastics will be used to a large extent for interior trim and fixtures, since the weight is satisfactory, maintenance is low, and appearance better than any other material.

Indirect lighting will be a "must." Also, seats should be comfortably spaced by providing adequate foot clearance underneath the seat and by the design of the foot rest.

Windows should be of double construction to afford better insulation against outside cold air in winter and hot air in summer when using air conditioning.

All outside metal of the body, regardless of the type of material and trim, must be made so that it is easy and economical to replace and repair, for accidents, whether major or minor, are bound to occur.

Heating, Air Conditioning and Ventilation – Heat must be thoroughly and uniformly distributed so there are no hot or cold spots. This calls for one or two large heaters with large fans distributing the heat evenly throughout the coach through ducts. The time may not be far off when we will be using an independent heater, and not engine water for heating coaches. The advantage in such a heater is that if engine failure were to occur, the coach interior could still be heated without running the engine. Heaters, of course, should be controlled automatically by thermostats.

Present air conditioning installations are heavy, troublesome, and expensive to service and maintain. It is my recommendation, therefore, that air conditioning engineers give consideration to the arrangement of two or more small "package" units similar to the type used in the average home refrigerator. Such units could be placed in proper locations within the body and easily be removed for repairs as a unit. If any one of the units were to fail, the body could still be cooled by other units in operating condition. These unit liquid compressors should be operated by electric motors deriving their power from the main engine generator, which would have to be increased for larger output.

Serviceability of Units – Many coaches have been built in the past wherein this subject has been given little or no consideration. Some of these items are:

1. The necessity of removing a complete powerplant to replace a clutch or transmission.
2. The removal of a radiator in order to repair a fan.
3. The removal of a complete powerplant in order to change a cylinder head.

. . . . . PROPELLERS

For Light Planes Given Tough Efficiency Tests

by K. D. WOOD
Purdue University, and
W. R. WOODWARD
Bell Aircraft Corp.

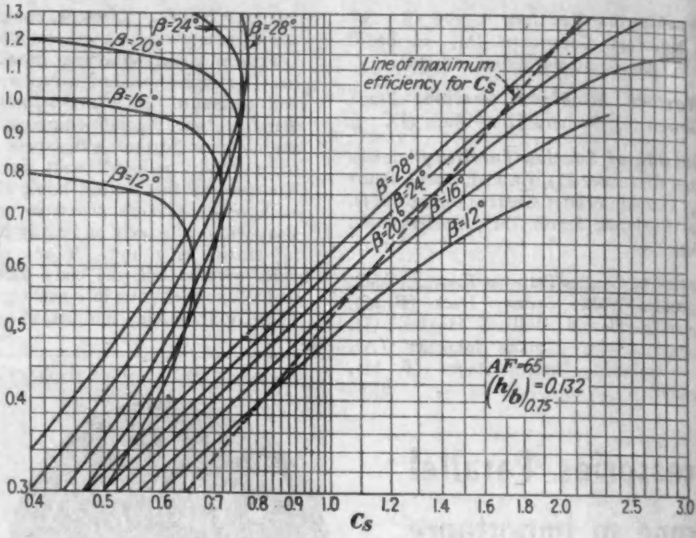
■ 1944 National Aeronautic Meeting

(*Excerpts from paper entitled "Propeller Efficiency of a Light Airplane"*)

THE tests here reported are flight tests, where the engine power was measured by means of a torque meter and the drag of the airplane without a propeller was measured by towing tests. The efficiency calculated from these data is known as "propulsive" efficiency, which is the quantity usually desired in airplane performance analysis.

The engine mount was designed to fit the standard mounting points on the airplane firewall, to fit inside the engine cowling, to incorporate various measuring instruments, to take care of towing attachments and towing loads, and to be simple and light as possible.

The engine, a 6-cyl opposed type, was installed and mounted in a floating cradle at the four standard mounting brackets plus six additional points at the top of the motor. This cradle was located in the fixed portion of the mount by two ⅞-in. needle bearings at the front and rear of the engine. The bearings were mounted on an axis about 2 in. above and parallel to the thrust axis. Torsional restraint of the motor cradle was obtained by use of flexible cables attached at points 4⅞ in. from the mounting bearing axis and secured to the fixed part of the mounting at points near the lower mounting points on the firewall. Clearance was provided for the engine cradle to move ⅛ in. fore and aft in the needle bearings.



■ **Fig. 1 – Propeller Design Chart**

Tension in the torque and thrust cables was measured by attaching hydraulic tension pickups to the cables. Thermocouples were placed on the pickups for determining the temperature effect on gage readings.

Special scoops inside the cowling were found necessary to obtain equal distribution of cooling air over the six cylinders. Small ducts added to the side of the cowling added considerably to the cooling and also increased high-speed performance.

Long flights showed insufficient cooling of the oil and consequently a duct was made integral with the carburetor duct for oil cooling air.

The hydraulic tension pickup was attached to the torque resisting cable on the right side of the engine. Pressure from the pickup was transmitted to gages in the cabin and to the photo-box through ordinary small copper (later plastic) tubing. Pickup for measuring thrust was similarly mounted on the thrust cable over the motor.

The torque gage was filled with commercial hydraulic brake fluid in order to eliminate trouble with dissolved gases and to reduce substantially the evaporation trouble. It was found that better pipe fitting was necessary to prevent leaks with the hydraulic brake fluid.

Thermocouples were installed in the torque and thrust pickups, for it was thought that engine heat would cause major errors in readings.

Tests were conducted during early morning hours to avoid high winds and bumpy air. Since the propeller was not the controllable type, it was necessary to take off with each propeller pitch setting desired. The usual flight-test procedure was to take off, climb to the greatest practical altitude, then start the tests with the highest possible V/nD – that is, with the throttle closed and the airplane in a dive so that a high velocity might be attained. It was found that 120 mph was a high enough velocity to attain the greatest values of V/nD. Above this speed, increase in speed of the engine due to windmilling was nearly proportional to the increase in forward velocity. The maximum necessary dive speed varied with the propeller setting considerably, a higher speed being necessary for the greater blade angles. Propeller blades were set at 28 deg at the 0.75 R station. Most of the data were taken photographically by the pilot.

Two ships started the takeoff run at a far end of the airfield and into the wind. The towed plane maintained an altitude of about 15 ft until the towing plane was in the air. Both planes then climbed until smooth air was reached. Test data were taken at air speeds from 40 to 120 mph. Several points were taken during the climb and all data taken above 85 mph were taken by diving. Releasing operation of the ship was carried out at a 500-or 1000-ft altitude over the field. The towed ship then made a 90-deg turn and landed into the wind. The tow rope was released by the towing plane in such a way that it stretched out ready for the next flight.

Fig. 1 is a design chart for one of the two propellers tested, in conventional form except that the scales have been made logarithmic for uniform accuracy and the efficiency has been plotted against the advance ratio J instead of against the speedpower coefficient C_s.